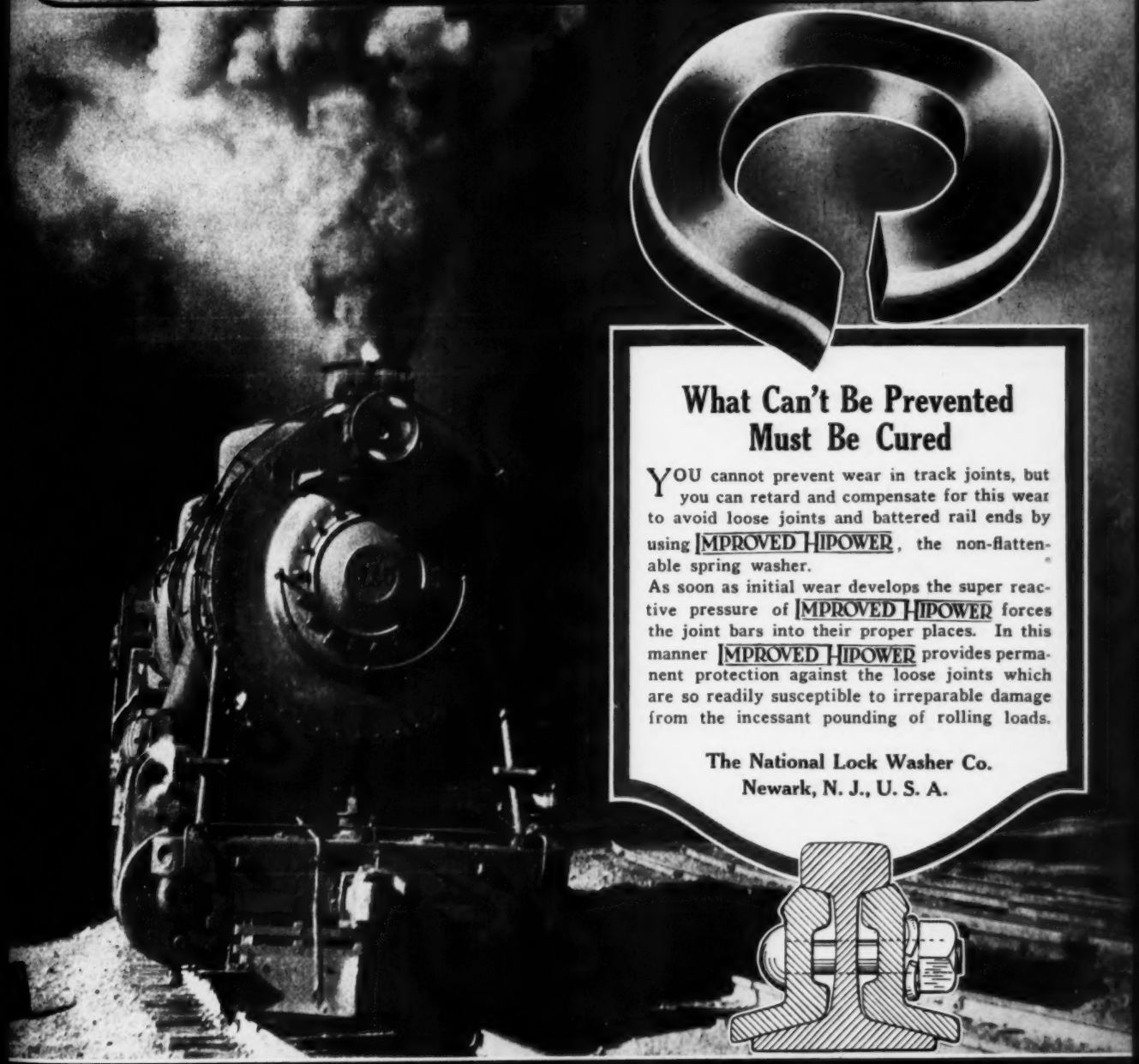
APRIL, 1925

Railway Engineering and Maintenance



What Can't Be Prevented Must Be Cured

YOU cannot prevent wear in track joints, but you can retard and compensate for this wear to avoid loose joints and battered rail ends by using IMPROVED HIPOWER, the non-flattenable spring washer.

As soon as initial wear develops the super reactive pressure of IMPROVED HIPOWER forces the joint bars into their proper places. In this manner IMPROVED HIPOWER provides permanent protection against the loose joints which are so readily susceptible to irreparable damage from the incessant pounding of rolling loads.

The National Lock Washer Co.
Newark, N. J., U. S. A.

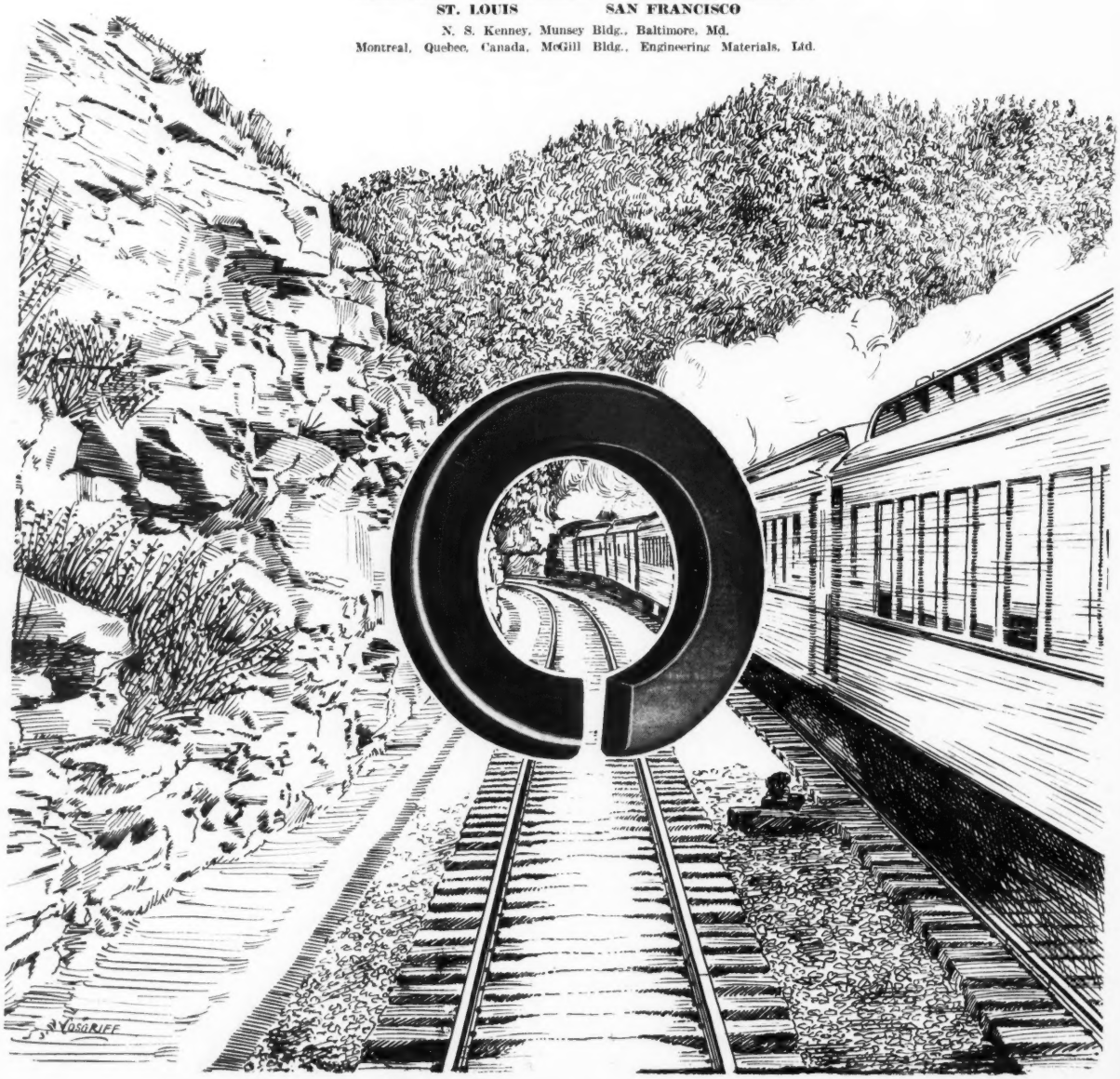
HIPOWER

HY-CROME

WHENEVER a railroad is interested in what a nut lock will do rather than what it costs HY-CROME is given preference. They keep nuts permanently tight.

THE RELIANCE MFG. CO.
Massillon, Ohio

NEW YORK CLEVELAND DETROIT CHICAGO
ST. LOUIS SAN FRANCISCO
N. S. Kenney, Munsey Bldg., Baltimore, Md.
Montreal, Quebec, Canada, McGill Bldg., Engineering Materials, Ltd.

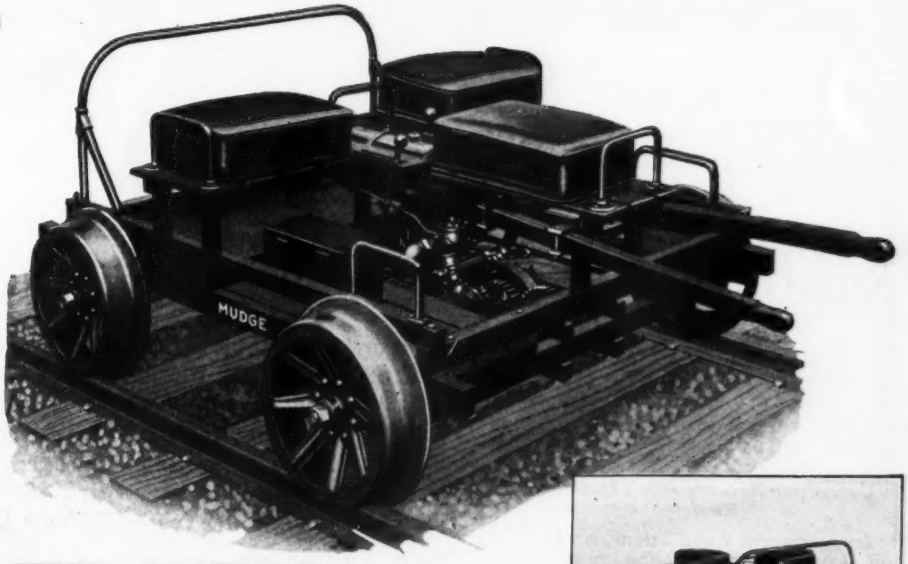


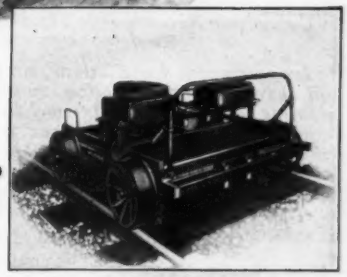
RAILWAY ENGINEERING AND MAINTENANCE
Entered as second-class matter June 23, 1916, at the post office at Chicago, Ill., under the Act of March 3, 1879. Published monthly by Simmons-Boardman Publishing Company at 608 S. Dearborn St., Chicago. Subscription price, United States, Canada and Mexico, $2.00 ...

You Will Find *Utility—Comfort—Safety* All Combined in This Car

12 big features

Ample Deck Space
Safety Railings
4-H. P. Motor
Air Cooled
Magneto Equipped
Gear Transmission
Seating Arrangement
Built for Comfort
Strong Wood Frame
Weight Distribution
Extension Lift Handles
Light Weight





THE MUDGE "Safety-First Roadster"

Class E-60

In this car we have incorporated all the elements that our fifteen years' experience in railroad motor car building has shown to be most desirable in a car of this type. Just how completely we have succeeded will at once be apparent.

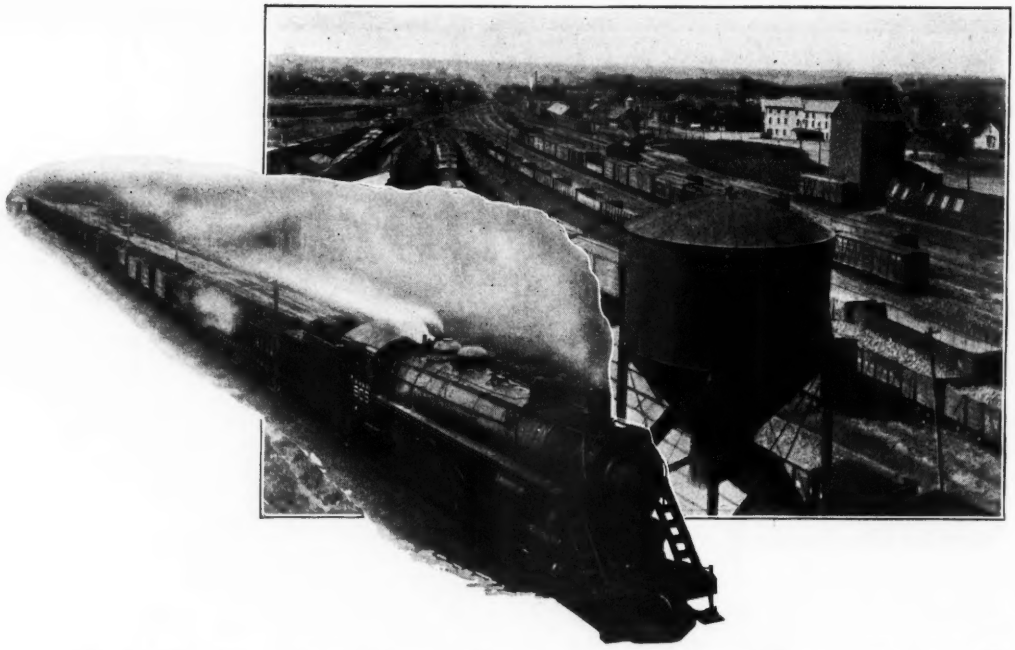
Even three or four of the features incorporated in this car would make it exceptional, but there are twelve outstanding major features, not to mention the many minor refinements which also contribute to its utility and durabilty.

Lifting Weight 161 Pounds

The Mudge line comprises a complete line of railway inspection and section cars, side drive or center load; direct connected or free running; air cooled or water cooled motors.

Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Bldg. • CHICAGO



Save $1600 to $4000 Per Locomotive Per Year

In regard to the influence of water supply on locomotive repairs Doctor C. H. Koyl (C. M. & St. P. Ry.) stated that in bad water districts the treating of the water may result in a saving of $1,600 to $4,000 per locomotive per year, depending on the quality of raw water. If the improvement in operating conditions is taken into account, this saving may reach $8,000.—Engineering News Record on the 26th meeting of Railway Engineering Association.

Every railroad official at the Association meeting knows this statement is true and that softening plants on his road will save money. He is checking over his engine districts to determine whether or not the quality of raw water warrants softening.

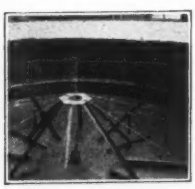
Not only the water department heads but other officials are taking seriously this conclusion of railroad men in regard to savings. They are interested in learning how the Horton Plant, with the combined settling and mixing chamber, accomplishes these savings.

Take, for instance, the smallest saving the Association meeting recognized. Capitalized at six per cent, it would amount to over $26,500, or several times the cost of a Horton Softening Plant. A plant at a station where the full softening saving could be effected, the difference between $1,600 and $8,000 would be *dividends;* a mighty handsome return on the investment.

You can learn all about the Horton Water Softening Plant by writing our nearest office for a copy of our bulletin describing a few installations we have made. If you do not have facilities to analyze raw water, send us a jugful and we will give you the analysis report without obligating you in the least.

Committee Recommends Floating Roof

In permanent installations, or for oil having large gasoline content, floating roofs and gastight steel roofs equipped with breather pipes have the advantage of reducing evaporation of gases and danger of fire.—Committee on Shops and Locomotive Terminals on Fuel-Oil Storage Tanks.



Wiggins Floating Roof on Oil Tank 30 Feet in Diameter

The committee recommended floating roofs and gastight steel roofs. They struck at the heart of the evaporation menace, noting that roofs should be designed to reduce circulation of air over the surface of the oil.

The Wiggins Floating Roof goes the farthest in reducing circulation of air over the surface because it completely eliminates the air over the oil.

SAVES YOU MONEY

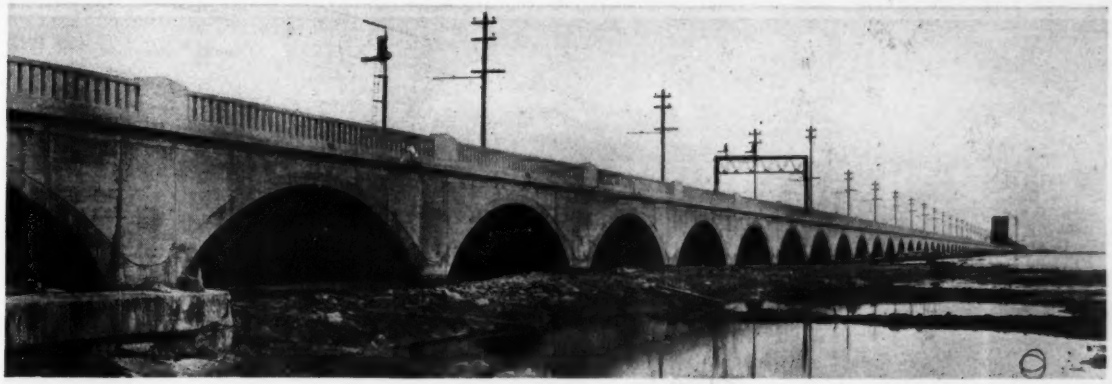
The Wiggins Roof, like the Horton Softening Plant, is the investment of a nominal equipment cost to prevent the unnecessary costs of operation. (In other words waste.) A Wiggins Roof on your fuel oil storage tank will pay for itself in six months in evaporation savings. Then it will go on paying big dividends to you every day. At the same time it is practically eliminating your fire hazard and very materially reduces your insurance.

CHICAGO BRIDGE & IRON WORKS

CHICAGO	NEW YORK	DALLAS	SAN FRANCISCO	ATLANTA
2452 Old Colony Building	3156 Hudson Terminal	1646 Praetorian Building	1007 Rialto Building	1036 Healey Building

416 HORTON STEEL WORKS, LTD., Bridgeburg, Ont.: Montreal: Toronto: Winnipeg

HORTON



The Galveston Causeway

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 21 April, 1925 Number 4

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WOULD YOU LIKE TO KNOW

How to keep rails from chipping at the ends?

How to prevent seepage under a dam?

Whether section motor cars should be used to haul material?

How to avoid supporting derrick cars on the old structure in erecting heavy viaduct girders?

How much one railroad has saved by using treated ties?

Answers to these and other questions will be found in this issue.

ELMER T. HOWSON, *Editor*
WALTER S. LACHER, *Managing Editor*
MILBURN MOORE, *Associate Editor*
DAVID A. STEEL, *Associate Editor*
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Published on the last Thursday preceding the date of issue by the

Simmons-Boardman Publishing Company, 608 South Dearborn Street, Chicago, Ill.

NEW YORK: 30 Church Street CLEVELAND: 6007 Euclid Avenue LONDON, England: 34, Victoria St., Westminster, S. W. 1
MANDEVILLE, LA. WASHINGTON: 17 and H Streets, N. W. Cable Address: Urasigmec, London
SAN FRANCISCO: 74 New Montgomery Street

Entered at the postoffice at Chicago, Ill., as mail matter of the second class.

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice.

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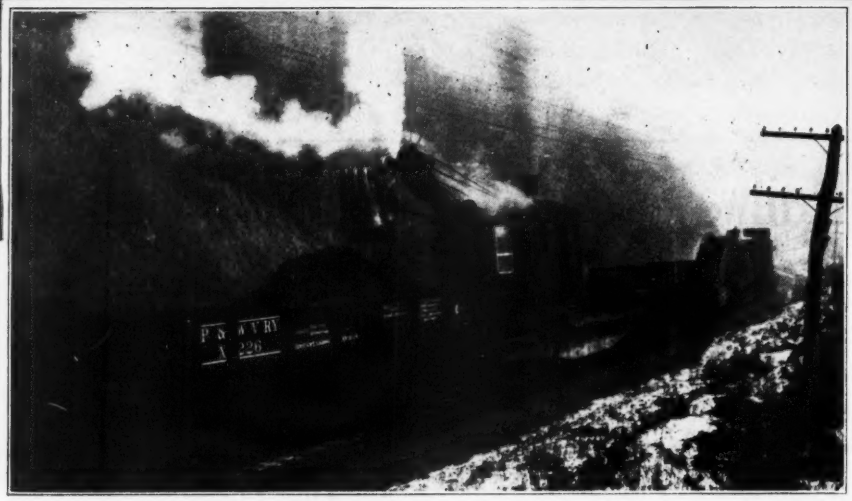
Subscription price in the United States, Canada and Mexico, $2.00 per year; foreign countries $2.00. Single copies, 25 cents. Foreign subscriptions may be paid through our London office (34, Victoria Street. S. W. 1) in £-s-d.

Railway Engineering and Maintenance is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulation (A. B. C.)



A SPLENDID TEAM
A Quick Loader and a Speedy Unloader

THE illustration shows a time and labor saving combination that's hard to beat, the ditcher for economical loading and the 30-yard Extension Side Dump Cars for speedy and economical dumping.

We emphasize the large car capacity (30 yards level, 43 yards normal loading) because we believe this size has many advantages over cars of smaller capacity. Even though the average ditcher does not reach the full length of 30-yard cars, a much greater yardage can be loaded into the 30-yard Extension Side Dump Car due to the large cross section area of the car body and low overall height from rail.

Then again, where ditcher service is seasonal, these larger capacity cars are of great value at other times in cinder service, bridge filling, bank widening and general construction work. Here the large capacity will justify unusually long hauls.

Write for leaflet No. 15

CLARK CAR COMPANY
PITTSBURGH, PA.

New York Office
52 Vanderbilt Ave.

Chicago Office
122 South Michigan Ave.

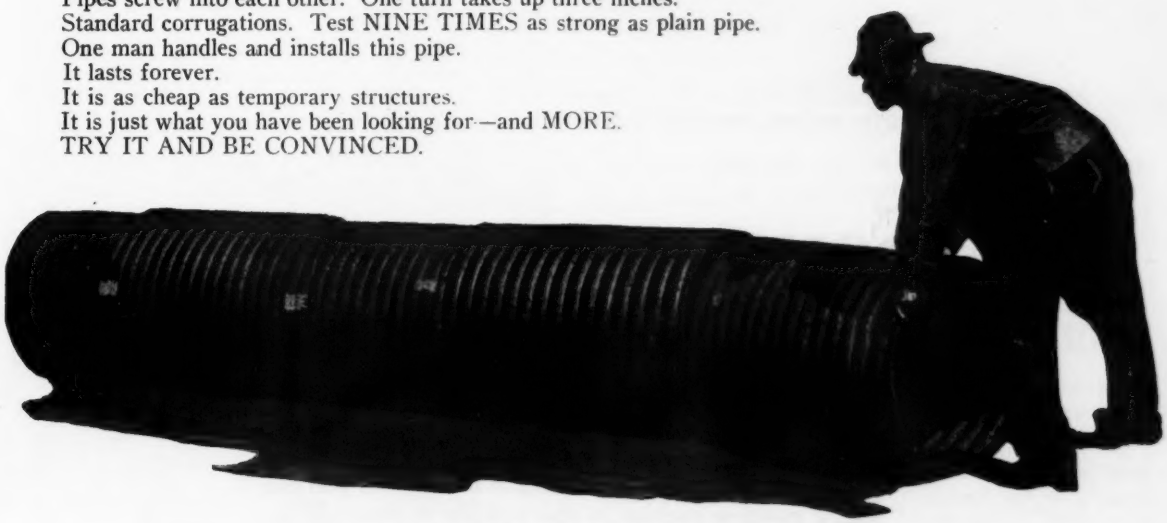
Extension Side Dump Cars
— Air Operated —

Introducing "THE MISSING LINK"

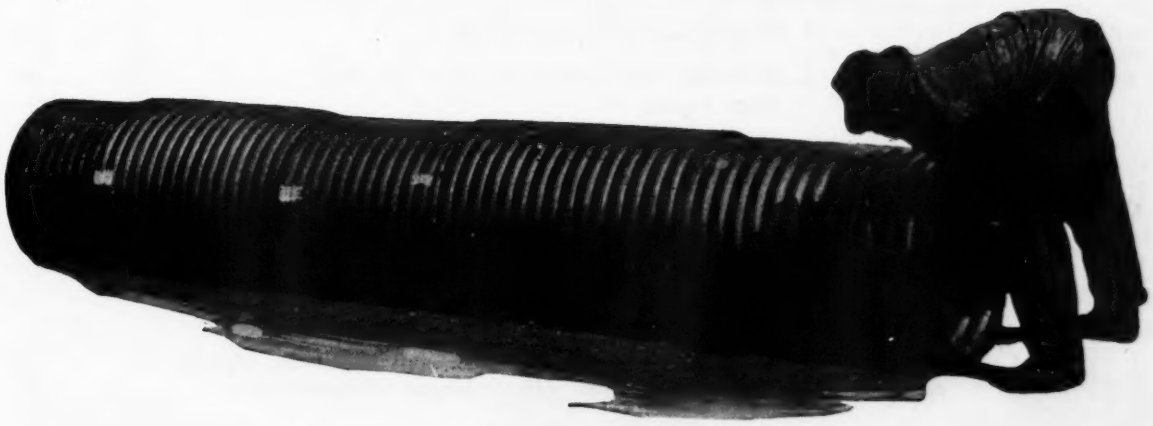
SPIRAL CORRUGATED CAST IRON CULVERT PIPE

Snappy Facts About It

Solid, round, vertically cast, pure remelted pig iron. *No scrap.*
Lengths of three feet, three inches.
Pipes screw into each other. One turn takes up three inches.
Standard corrugations. Test NINE TIMES as strong as plain pipe.
One man handles and installs this pipe.
It lasts forever.
It is as cheap as temporary structures.
It is just what you have been looking for—and MORE.
TRY IT AND BE CONVINCED.



Entering the Pipe by Rolling in on an Angle.



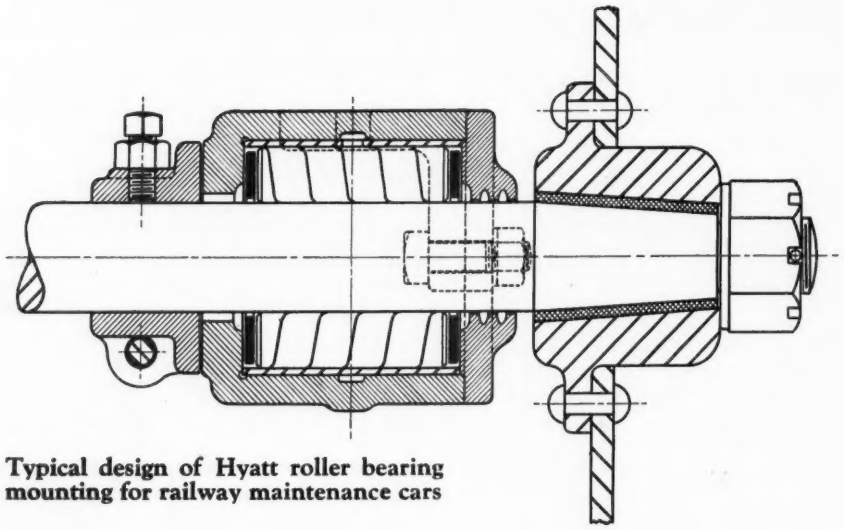
Screwing Pipe Together. One Turn Takes Up Three Inches

WE HAVE BEEN MAKING CAST IRON CULVERT PIPE FOR TWENTY YEARS

Write for Details and Prices

American Casting Company

Box 591 BIRMINGHAM, ALA.



Typical design of Hyatt roller bearing mounting for railway maintenance cars

Save—

Labor and Worry

SOME labor costs for road-bed maintenance are fixed since there comes a time when good judgment calls a halt on further reduction of force. But you can secure positive savings in the upkeep of your section cars by installing Hyatt bearing equipment.

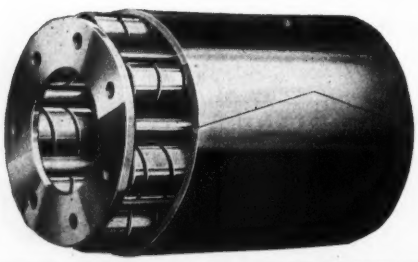
Hyatt bearings in section cars save labor costs by:

1. Cutting down car inspections.
2. Reducing lubrication to three or four times a year.
3. Doing away with bearing adjustments, repairs and replacements.

The easy turning and positive lubrication of Hyatt bearings insure continuous, smooth running under all loads. Their rugged construction stands up under overloading and abuse.

Hyatt equipped section cars are dependable. Their steady, carefree performance relieves you from worry about breakdowns and costly upkeep. That is why the manufacturers have built Hyatt bearings into their cars for many years.

Save labor costs and worry. Specify Hyatt equipped maintenance cars.



Rapid strides have also been made in the adoption of Hyatt bearings for *heavy* railway cars. Up-to-date information is yours for the asking.

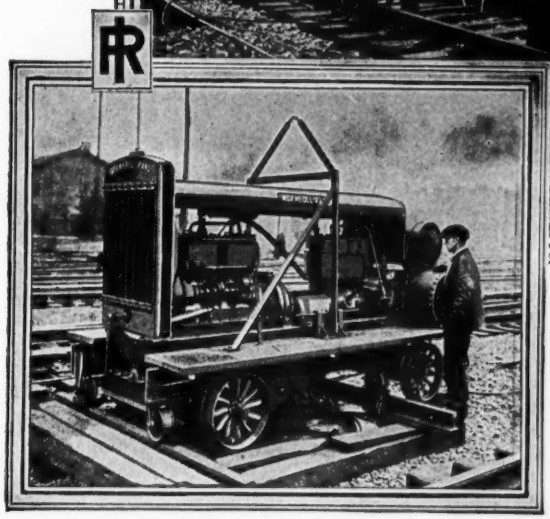
HYATT ROLLER BEARING COMPANY

NEWARK DETROIT CHICAGO SAN FRANCISCO

WORCESTER PHILADELPHIA CHARLOTTE
PITTSBURGH CLEVELAND MILWAUKEE

HYATT ROLLER BEARINGS FOR RAILWAY MAINTENANCE CARS

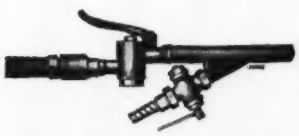
Twelve pneumatic tie tampers operated from a tie tamper air compressor



Some of the air tools operated from a tie tamper compressor

Pneumatic Tie Tamper

Portable Pneumatic Grinder



Sand Blaster Paint Spray

Labor Aiding Compressed Air Tools

A pneumatic tie tamping outfit and air tools make it possible to save labor and speed up the work on dozens of operations.

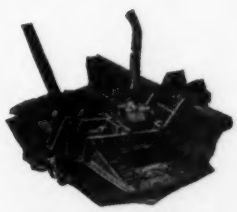
The pneumatic tampers enable each man to tamp three to four times as much track per day as by hand methods and to do a much better job. They make a big saving of labor

Other air tools and devices such as sand blast and paint sprays, grinders, pneumatic wrenches, rail bonding drills, rail drills, riveting hammers, etc., can be used with tie tamper compressors further increasing the labor savings. Ask for complete information.

INGERSOLL-RAND COMPANY
11 BROADWAY NEW YORK CITY

Offices in principal cities the world over.
For Canada Refer—Canadian Ingersoll-Rand Co., Limited,
260 St. James Street, Montreal, Quebec.

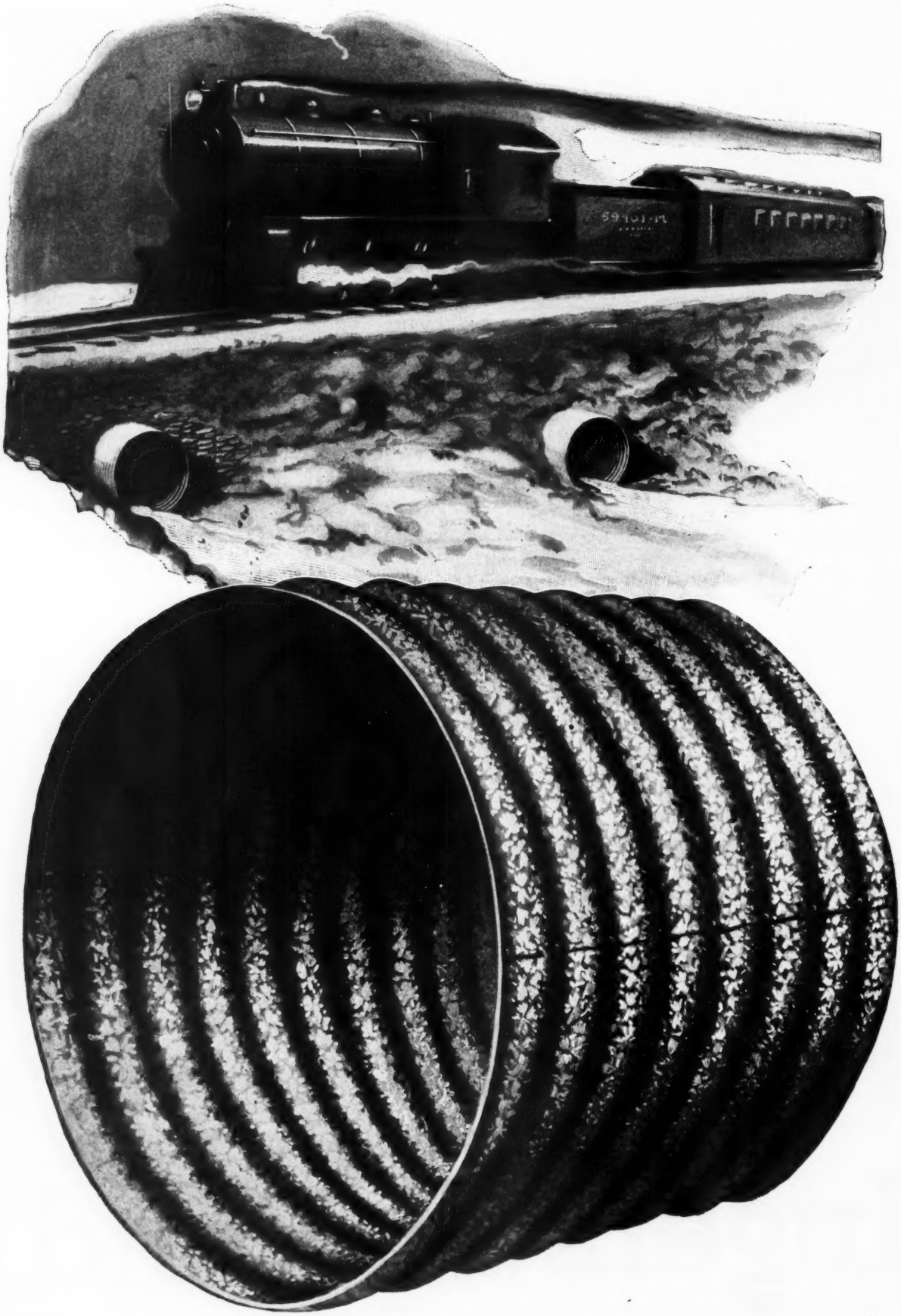
Pneumatic Wrench



Bail Banding Drill
Drills up to 9/16" die

No. 9 Rail Drill
Drill 9/16" and larger

Ingersoll-Rand



Wheeling HAND DIPPED

ZINC COATED AFTER FORMING

Culverts

Culvert life and usefulness take on a new meaning when edges and surfaces are uniformly and heavily coated with pure zinc after forming.

The new and exclusive Wheeling process of hand dipping formed culverts supplies you with a sheet metal culvert unmarred and unscarred on the surface. The zinc coating fully protects a rust resisting copper bearing steel base. It is a heavier and a more efficient coating than is available in the culvert formed from galvanized sheets.

The corrugated metal culvert is a recognized essential to economical culvert construction—the Wheeling Hand Dipped Culvert offers still greater advantages than have been heretofore possible.

You should be interested in this marked advancement in culvert manufacture. Before buying culverts, write to Wheeling.

WHEELING CORRUGATING COMPANY
WHEELING, W. Va.

New York	Kansas City
Chicago	Chattanooga
Philadelphia	Richmond
St. Louis	Minneapolis

Quality ABOVE ALL ELSE

THE term *International* quality has a particular significance in the tie field. It represents that absolute dependability which eliminates chance from tie buying.

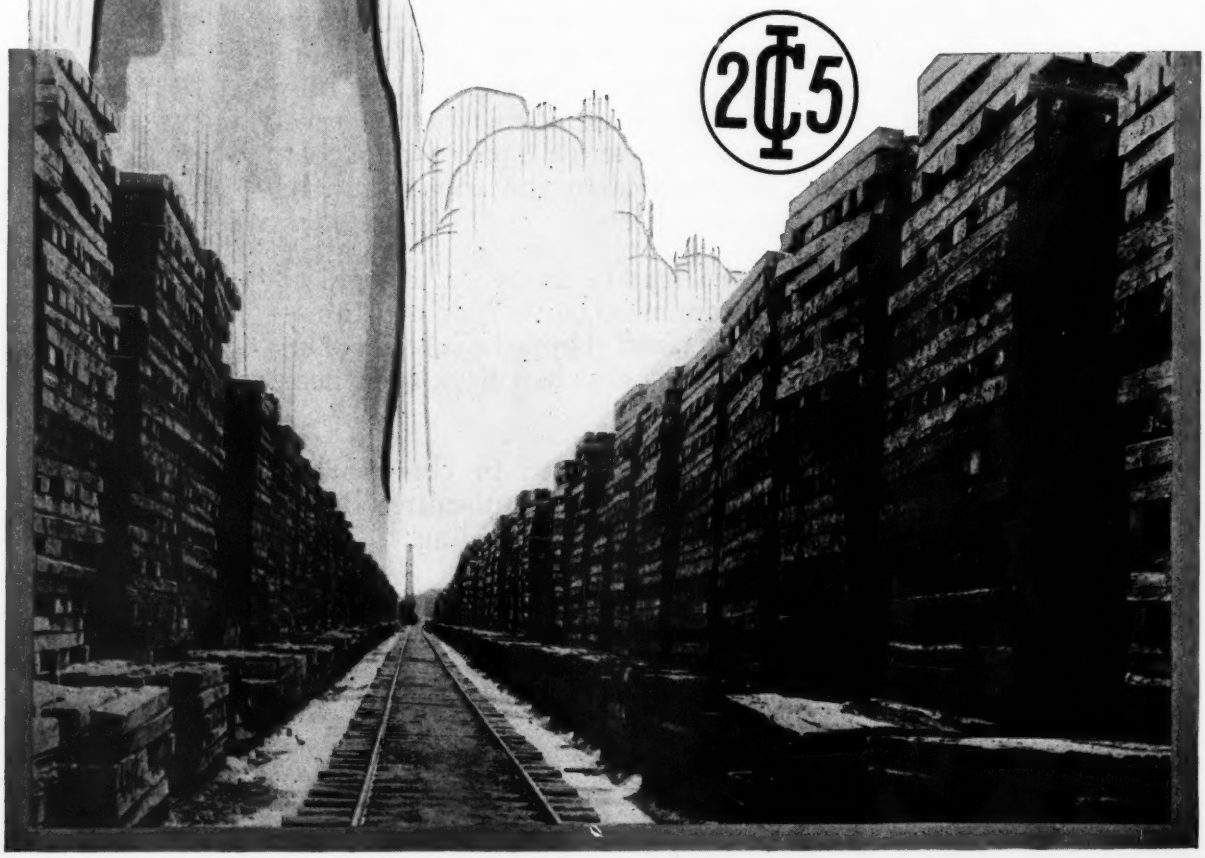
International Tie Quality stands for sound timber, quick removal of the ties from woods, accurate grading, thorough seasoning, and effective treatment with high grade preservatives.

Every *International* Tie is trademarked permanently with an *International* dating nail. This nail is a practical guarantee, assuring the tie buyer that every phase in the production, seasoning and treatment has been carefully carried out. The *International* purpose is not simply to sell ties, but to excel in every way possible.

International Creosoting & Construction Co.

General Offices — Galveston, Texas

Plants: Texarkana, Texas Beaumont, Texas Galveston, Texas



20 OR 4000 BLOWS?

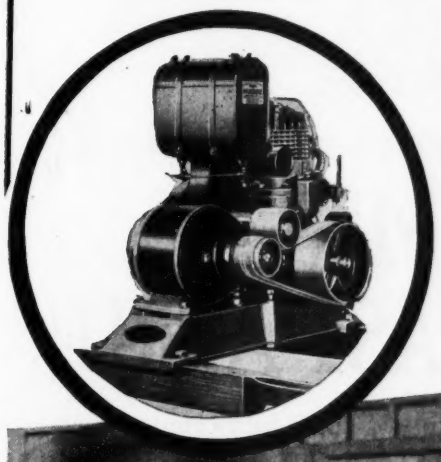
The average man with a pick will deliver about 20 uneven blows to the ballast a minute.

A Jackson Electric Tie Tamper delivers 4000 uniformly applied blows per minute, each blow in the proper direction.

The rate of advancement is correspondingly rapid and, equally important, the roadbed is evenly tamped.

Power for the Jackson Electric Tie Tamper is furnished by the Jackson Power Plant.

Each plant is capable of operating 4 tampers in unison, giving a total delivery of 16,000 blows per minute.

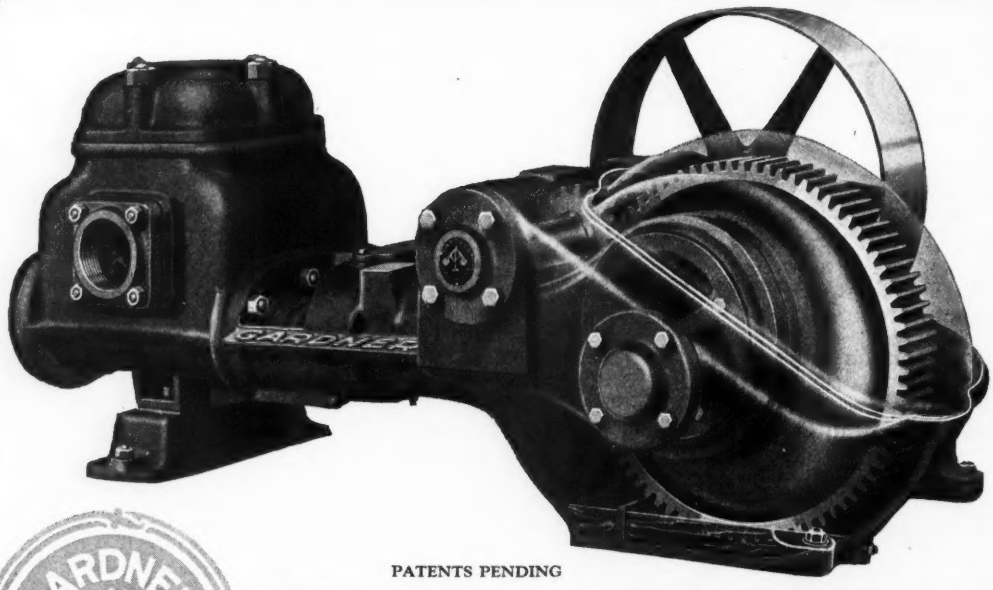


The power plant is light in weight, portable and can be moved to any place along the track. It requires no special foundation.

The power plant is also universal. Furnishes power for light and tools that are usually operated from commercial power circuits.

Write us for full details.

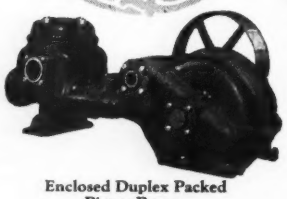
ELECTRIC TAMPER & EQUIPMENT CO.
RAILWAY EXCHANGE CHICAGO, ILLINOIS



PATENTS PENDING

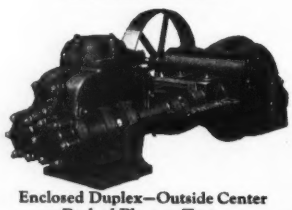
GARDNER
GOVERNORS
PUMPS · COMPRESSORS

OILED 3 TIMES SINCE LAST APRIL



Enclosed Duplex Packed Piston Pump.

Packed Piston Type Direct Connected to Motor.



Enclosed Duplex—Outside Center Packed Plunger Type.

One of our new enclosed, flood-lubricated power pumps has been giving continuous water service in our own shops since last April. Lubricating oil has been added only three times since. Each time a single quart of oil was added to the old oil remaining in the reservoir. Our statement that this new pump requires oiling only once a month instead of daily is thus seen to be conservative.

The ideal pump for railroad water service where operation is by remote control and it is convenient to inspect the pump only at long intervals. Strictly a GARDNER innovation. World wide interest is being manifested. Ask for Bulletin EP-1.

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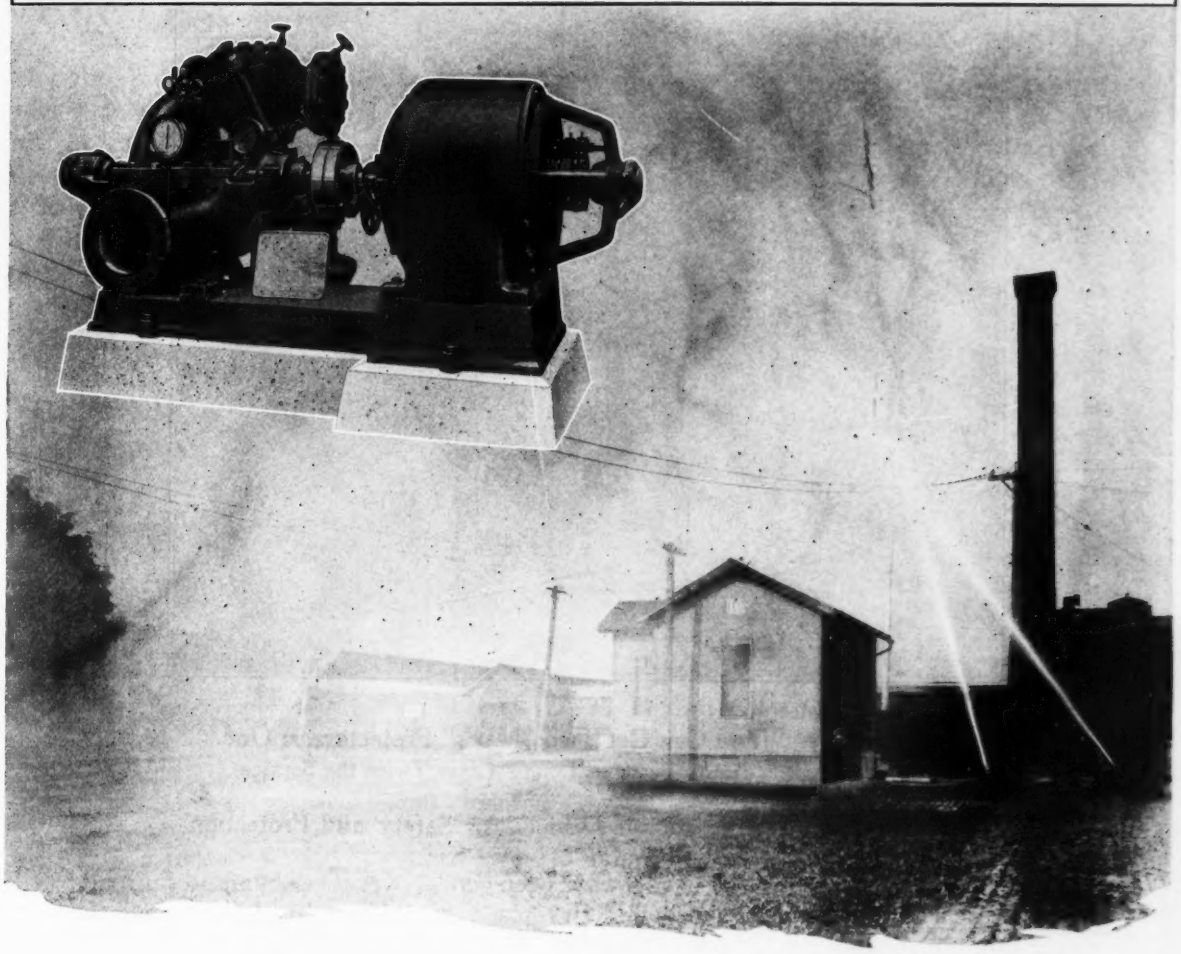
If Your Supply Company Can't Supply You, Write Us Direct

GARDNER

AMERICAN
AURORA, ILL.



"American" Fire Protection!

Pictured is an "American" 1500 gallon Fire Underwriter's Pump, on test after installation at the C. B. & Q. Railroad Sheep Yards at Montgomery, Illinois.

This pump is a single stage, double suction, "American" Underwriter Pump, and provides six fire streams at 100 lbs. pressure.

"American" pumps are the best insurance against fire. *Are you protected?*

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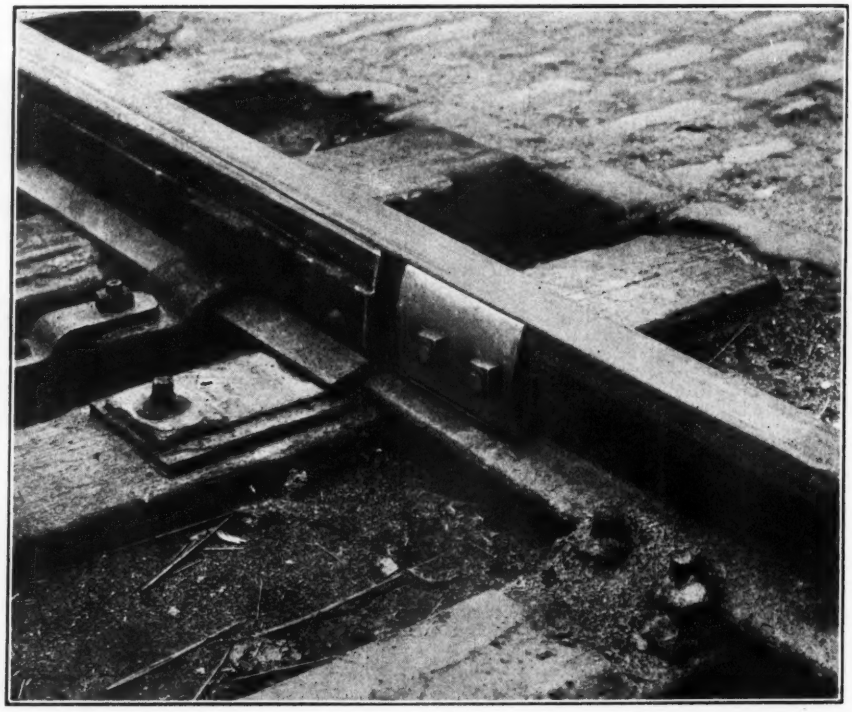
ANNOUNCING The New Improved REVERSIBLE "Mack" Switch Point Protector



NOW! You Can Get Two "Mack" Protectors in One.
Lasts Twice as Long—Gives Twice the Service

The Greatest of All Economic Devices for Safety and Protection

"Mack" Switch Point Protectors have always been good—over three hundred railroads are at present saving thousands of dollars in replacement of switch points through the protection afforded by the "Mack" Protector. It is common for switch points to last at least ten times longer with "Mack" Switch Point Protectors. ***But,*** as good as the "Mack" Protector has been in the past, with all its features of proficiency and economy, ***it has been revolutionized—and NOW,***

We introduce the REVERSIBLE "Mack" Switch Point Protector

This new revolutionary feature consists of a double edge protector, which gives twice the wear of the old protector. After one edge of the protector shows wear through long service, the protector is simply inverted—the lower edge becomes the top edge, and you have a new protector.

"Mack" Switch Protectors are made of manganese steel, for any size rail.

Send us a description of rail used, and we will furnish you a few protectors for test

J. R. FLEMING & SONS CO., Inc.
SCRANTON, PA.

PATENTED IN U. S. AND FOREIGN COUNTRIES

NEW HACKMANN TRACK LINER

THE HACKMANN COMBINATION LINING BARS AND BASES SAVE 50% OF YOUR TOOL COST

HACKMANN Track Liners Will Line Track, Frogs, Switches, Space Ties, Raise Low Joints, Without Disturbing the Road Bed. No Digging Necessary

50% Labor Cost Saved

3 Men With Hackmann Type B Track Liners Do the Work That Required 7 Men Under the Old Method Hackmann Track Liners Will Pay For Themselves By the Saving in Labor Cost

NO. 1 LINING BAR

HACKMANN COMBINATION LINING BARS
(VERONA MADE—HEAT TREATED)

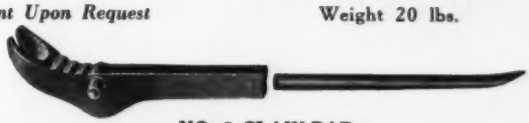
The No. 1 lining bar with chisel end, the No. 2 combination tamping and lining bar and the No. 3 combination claw bar with chisel end, are all drop forged from special steel specially tempered with 1-inch drop forged lugs as an integral part of the bars, for use with Hackmann bases.
Tests on different roads have proven conclusively that the new Hackmann Type B Combination Track Liner gives more than double the efficiency of any liner now on the market.

DEMONSTRATIONS
We Will Gladly Demonstrate the Efficiency of This Equipment Upon Request

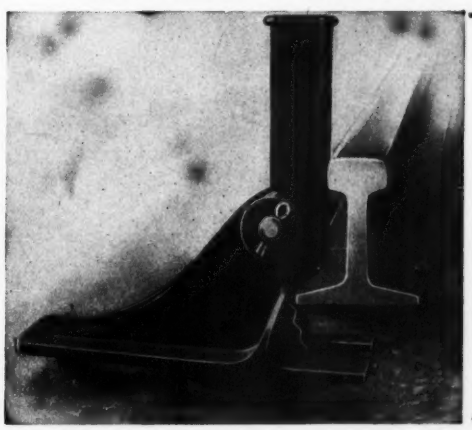
NOTE THE TWO STEP FEATURE AT TOP OF BASE

Weight 20 lbs.

NO. 2 TAMPING AND LINING BAR



NO. 3 CLAW BAR



The IDOL TRACK LINER

NOW IN USE ON 86 RAILROADS

The Idol Track Liner will line track frogs, switches, space ties, raise low joints without disturbing the road bed as no digging is necessary. They will pay for themselves every day by work you will be able to do with a few men. They will save you 50% in labor costs.

THE HACKMANN RAILWAY SUPPLY CO.

RAILWAY SAVING DEVICES
723 South Wells Street
CHICAGO, ILLINOIS, U. S. A.

FREDERICK HACKMANN,
President and Mechanical Engineer
J. J. FRANZEN,
Secretary and Treasurer

VERONA TOOL WORKS
Verona, Penna.

SALES REPRESENTATIVES
LAUGHLIN & CHENEY
Strauss Bldg., Chicago, Ill.

BALDWIN LOCOMOTIVE WORKS
Foreign Representatives

No "fingering" down
No accidents!

Safe!

Combination Trip and Automatic Lowering Jack No. 110

Here is a track jack built at the suggestion of practical railroad men everywhere. "What we would like to have," they said, "is a trip jack which does not have to be fingered down. Fingering down causes accidents — and it's slow business anyway."

So, here it is: The good old Barrett No. 1, with many important improvements. It can be lowered or adjusted downward simply by pushing the Reversing Lever up — then ratcheting, exactly as done in raising.

The capacity is 15 tons, yet is weighs no more than the average 10-ton jack, and takes much less power to operate. Better steel, and less friction, easier tripping, better leverage account for these big improvements.

This jack has now been in service on some roads for nearly a year, and every man frankly admits it is by long odds the best track jack he ever used.

Send for descriptive circular.

The Duff Manufacturing Company

Pittsburgh - Pennsylvania

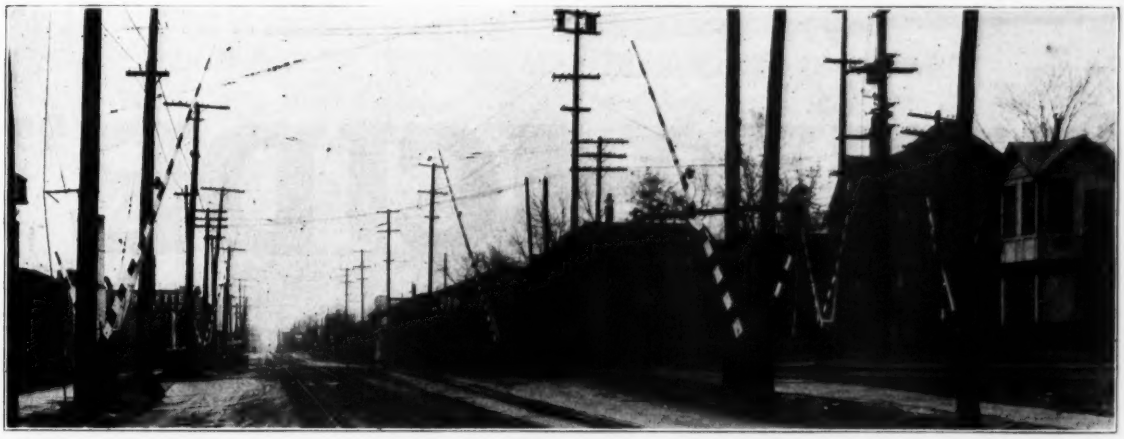
Established 1883

The Ultimate Track Jack

KALAMAZOO

ELECTRIC CROSSING GATE

GIVES POSITIVE PROTECTION FOR RAILROAD GRADE CROSSINGS



SIX POST INSTALLATION KALAMAZOO ELECTRIC CROSSING GATE
ALL OPERATED FROM ONE TOWER

EASY TO OPERATE POSITIVE CONTROL
NOT AFFECTED BY WEATHER CONDITIONS

One man can operate gates for two or more crossings. The operator has perfect control, any or all of the gates can be stopped, started or reversed instantly, by simply manipulating the switches. It is not necessary to complete the throw of the arms before stopping or reversing as this can take place at any point. This makes it possible to avoid the expense of a majority of the breakages which occur so frequently when other types of gates are lowered ahead of a moving automobile or truck.

Try a set of Kalamazoo Electric Crossing Gates at your next crossing problem and be convinced that the gate problem is solved.

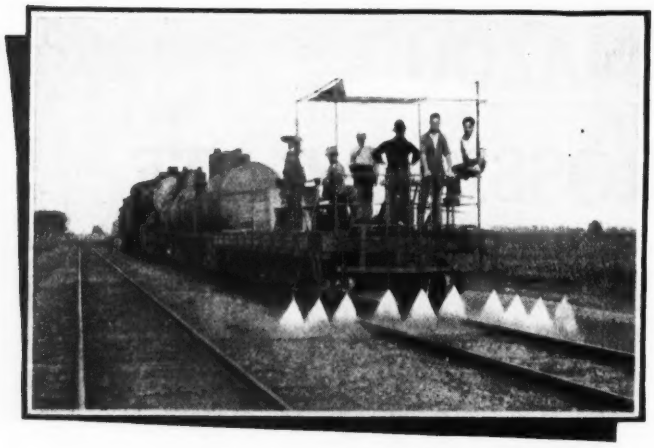
Write us for full particulars

KALAMAZOO RAILWAY SUPPLY CO.

MANUFACTURERS

KALAMAZOO, MICH., U. S. A.

CABLE ADDRESS "VELOCIPEDE" KALAMAZOO WRITE FOR OUR CATALOGUE



Quicker Better and *far more* Economical

"HERBICIDE"

The Weed Exterminator

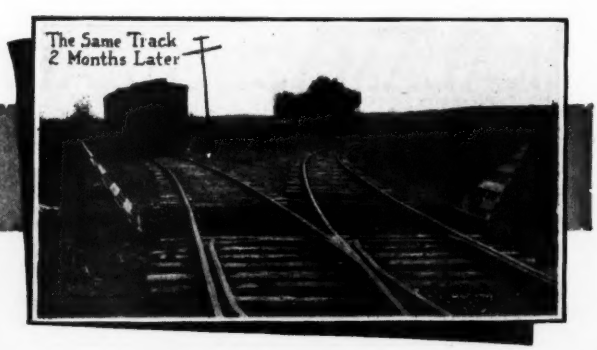
—is used on greater railway mileage each year because—

1. It is *quickly* and *easily applied.* About 60 miles of track is an average daily accomplishment with a Reade Spray Equipment.
2. It *kills the roots* as well as the tops without any injurious effect upon the rails or ties. In fact "HERBICIDE" is an excellent wood preservative.
3. It *costs far less* than hand weeding (from ¼ to ½ as much) and one application lasts for the season.

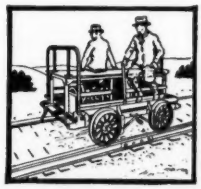
Complete information including costs sent upon request

Reade Manufacturing Company, Jersey City, N. J.

Works: Jersey City and Chicago



BUDA
ESTABLISHED
1881



Railway Motor Cars

"LIBERTY"

PORTABLE HAND OPERATED

TOOL GRINDER

Crossing Gates

POSITIVELY ELIMINATES WASTEFUL GRINDING
REDUCES COST OF TOOL MAINTENANCE TO A MINIMUM

HOLDER & FEED REGULATOR

(Used with Flat and Twist Bits)
Calibrated Dial Insures Perfect Adjustment

Easily Operated by Unskilled Labor
Poor Grinding and Drawing of Temper Impossible
All Adjustments by Hand—Easily and Quickly

THOUSANDS IN SERVICE

Track and Bonding Drills

CATALOG ON REQUEST

THE BUDA COMPANY

HARVEY (Chicago Suburb) ILLINOIS

30 Church Street NEW YORK
Railway Exchange CHICAGO
Railway Exchange ST. LOUIS
664 Mission St. SAN FRANCISCO

Ratchet Jacks — Cone and Ball-Bearing Jacks

Obtain better blasting results at lower costs

Du Pont chemical engineers insure uniformity of quality by chemical control through every step of manufacture from raw material to finished product.

WHEN you buy du Pont explosives you buy something more than a commercial product.

Back of every pound of du Pont explosives is the knowledge and experience gained during 122 years in the development and production of explosives.

The uniformity of its products has made the du Pont Company's explosives standard throughout the world. This uniformity is obtained through the exercise of the most careful selection of all materials and the complete chemical control of every stage of production from raw material to finished product.

Because of the quality and efficiency of du Pont explosives their users do obtain *better* blasting results at *lower* cost.

Blast with du Pont powders

There is a du Pont explosive to meet every blasting need—to do **your** particular work **best** at **least** expense. For contracting we especially recommend:

Red Cross Extra Dynamite: 20% to 60% strength; low-freezing; fairly water-resisting; heaving and lifting action.
Du Pont Gelatin Dynamite: 25% to 90% strength; water resisting; low-freezing; dense, plastic, less obnoxious fumes.
Du Pont R. R. P. (Judson type): 5% strength and low-freezing.

Du Pont blasting powder is the most widely used low explosive. It is regarded as standard everywhere. Every keg bears the orange band.

Du Pont blasting accessories give you maximum efficiency from your explosives. Make every shot sure—protect your blasting investment by using only du Pont accessories.

Fur further information about du Pont explosives and blasting accessories, please refer to "Road and Street Catalog"—or write to our nearest office.

E. I. DU PONT DE NEMOURS & CO., Inc.
Explosives Department
WILMINGTON, DEL.

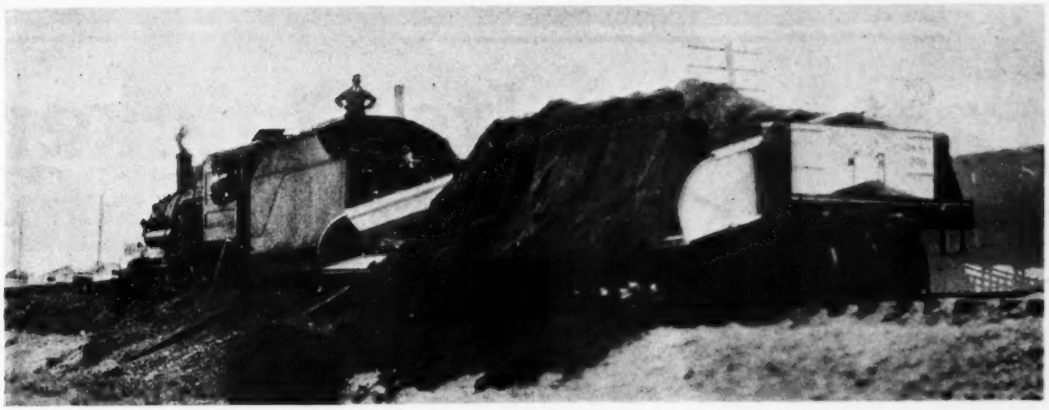
Branch Offices:

Birmingham . Ala.
Boston . . Mass.
Buffalo . . N. Y.
Chicago . . . Ill.
Denver . . Colo.
Duluth . . Minn.
El Paso . . Tex.
Huntington . W.Va.
Joplin . . . Mo.
Kansas City . Mo.
Mexico City . Mex.
Miami . . . Fla.
New York . N. Y.
Pittsburgh . . Pa.
Portland . . Ore.
St. Louis . . Mo.
San Francisco Calif.
Scranton . . Pa.
Seattle . . Wash.
Spokane . . Wash.
Springfield . . Ill.

Du Pont Products Exhibit Atlantic City, N. J.

DU PONT

POWDER MAKERS SINCE 1802



USE DUMP CARS

Because

They save labor.

They save time.

They save money.

They decrease overhead.

They get the work done on schedule.

They can be used on a variety of work.

CHOOSE DIFFERENTIALS

Because

They perform all Dump Car functions and

They dump to either side without any change in mechanism.

They dump further from the track.

They are lower in height.

They tilt to steeper angle so as to insure discharge of very sticky stuff.

They dump material of any size.

They can dump part of load without dumping remainder.

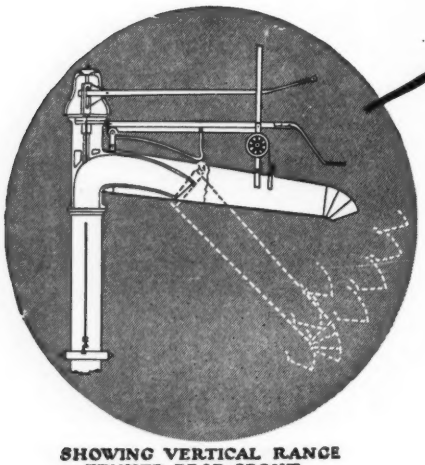
They dump without shock or strain.
RESULT—Long life, low maintenance.

The Differential Air Dump Car Is All Steel and Has a Capacity of 30 Cu. Yds. Level Full

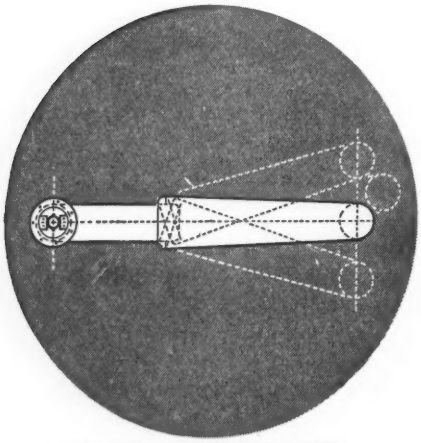
Complete description in Bulletin D-12

THE DIFFERENTIAL STEEL CAR CO.

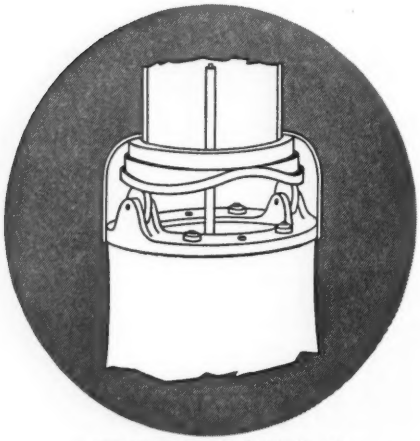
FINDLAY, OHIO



SHOWING VERTICAL RANGE
FENNER DROP SPOUT



SHOWING LATERAL RANGE
FENNER DROP SPOUT



GRAVITY TURNING &
LOCKING DEVICE

Its Quicker-Easier-Safer

to fill your tender tanks with

POAGE *Style* "H" WATER COLUMN

Equipped with

Fenner Drop Spout

Quicker and Easier because the spout can be instantly brought into play without accurately spotting the tender. It works equally well with tenders of different heights. The spout has a vertical range of five feet and a lateral range of three.

The spout is non-freezable. Heavy icicles will not gather upon it. There is no packing at the open telescopic joint, yet, it does not leak a drop of water.

Safer—as soon as it is released the spout swings by gravity to a position parallel with the track and remains there locked. There are no unsafe locking devices to be operated.

The three foot lateral range of the spout prevents the column being tipped over if the tender shifts unexpectedly.

There is no danger of water hammer bursting the mains. The Poage Style H valve shuts off 85 per cent of the flow very quickly and the remaining 15 per cent more slowly—the the correct principle to secure quick closure without water hammer.

Try the Poage Style H Water Column—It's better.

MANUFACTURED EXCLUSIVELY BY

The **AMERICAN VALVE & METER COMPANY**

CINCINNATI, O.

Guarantee

Owen Buckets, properly installed and operated, are guaranteed to do a bigger day's work than any other bucket of the same weight and capacity—

—or—

Write your own guarantee!

OWEN BUCKET CO.

A Mouthful at Every Bite

Action—lightning-like in its speed—characterizes the wolf. Action, quite relative to be sure, characterizes Owen Buckets.

This bucket is so designed that the action can be controlled for different materials, rendering its maximum effectiveness on every job.

What will an Owen Bucket do for you?

For one thing, it will take a bigger load at every grab.

It will handle faster and take more loads in a day.

It will cut down repair bills because it is built to stand the most severe strains.

It will render more working hours in a life time.

All in all, it will save money and make money for you.

We know these facts to be true and can prove them to you. Will you let us?

Send for folder 1-A which makes these statements self-evident.

THE OWEN BUCKET COMPANY

405 ROCKEFELLER BUILDING CLEVELAND, OHIO

1 yard Type "J" Bucket owned by the Fairlawn Supply and Coal Co., Fairlawn, Ohio, and used for handling 2½" crushed stone. Crushed stone is one of the hardest materials to handle and an Owen Bucket was chosen after two other makes had failed.

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAYS WORK

Owen Buckets

INSURE A BIGGER DAY'S WORK

© O. B. Co.

ARMCO Culverts in Railway Service

No. 17 of a Series

Name of Railway: Chicago Great Western.

Location: Main Line Tracks, near Gilliat, Iowa.

Traffic: Average passenger and freight.

Installation Data: 48-inch, 10-gauge, ARMCO Culvert 120 feet long, under approximately 35-foot fill of clay, slightly sandy. Installed 1910 or 1911.

Condition: Excellent. Photographed and inspected Jan. 9, 1922.

Remarks: Present construction calls for double riveting on culverts of this size. Ends are now rodded.

There is a manufacturer in almost every state and in Canada, making Culverts, Flumes, Siphons, Tanks, Roofing, etc., of genuine, rust-resisting Armco Ingot Iron. Write for full information and nearest shipping point on products in which you are interested

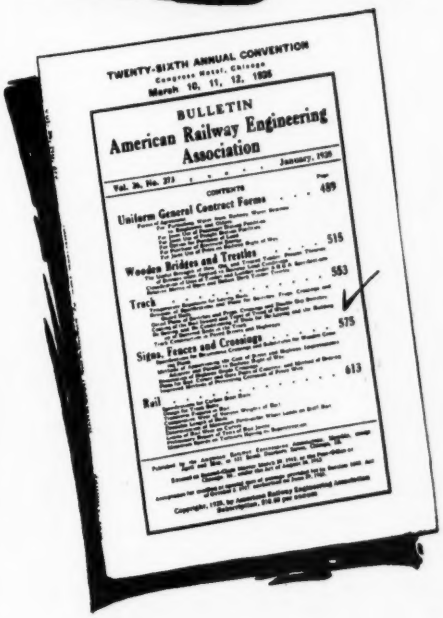
ARMCO Ingot Iron

ARMCO CULVERT & FLUME MFRS. ASS'N, Middletown, Ohio

ARMCO CULVERTS

LUNDIE

MEETS A. R. E. A. RECOMMENDATIONS



AS appears on page 566 A. R. E. A. Bulletin No. 273.

1. Rail should be canted inwardly.
2. Inclined tie plates should be used to produce the desired cant.
3. Amount of cant should be 1 to 20.

LUNDIE TIE PLATES

Maintain rigid gauge under every traffic condition—Do not slip nor rattle.

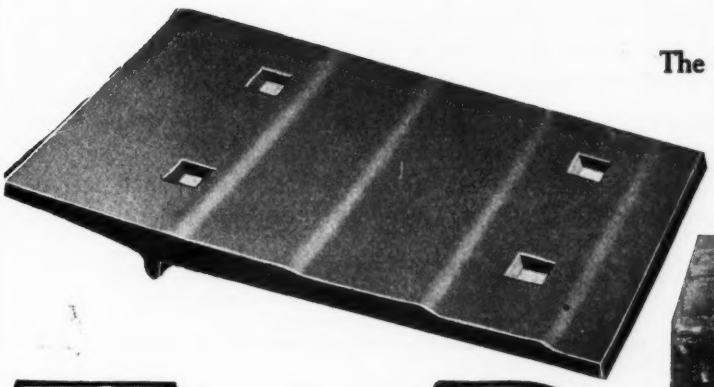
Insure uniform wear on head of rail, increasing rail life.

Prevent the cutting of a single fibre of the tie, ensuring maximum tie life.

Reduce flange wear.

Reduce wear on wheels.

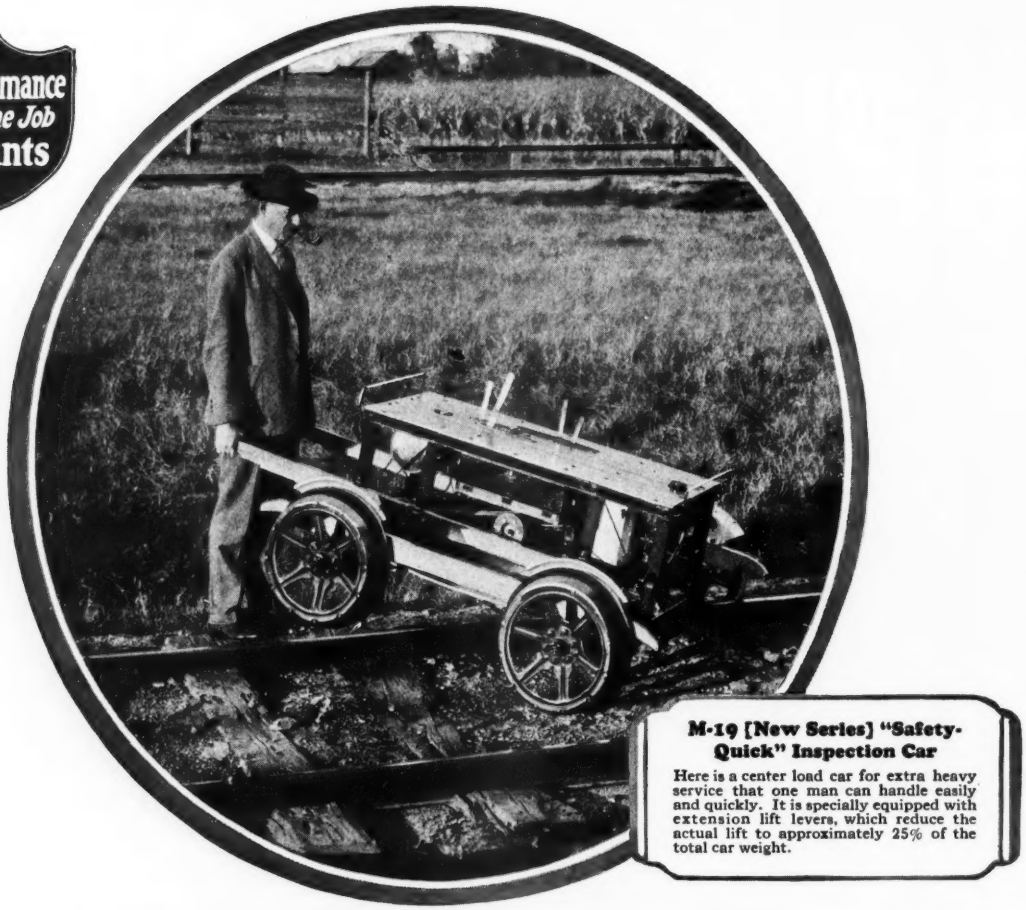
Give greatest efficiency—over longer periods at lowest cost of maintenance.



The Lundie Engineering Corporation
920 Broadway, New York
166 West Jackson Boulevard, Chicago

TIE PLATE

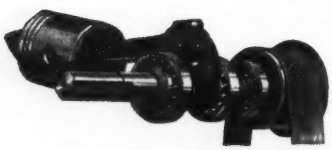
Performance on the Job Counts



M-19 [New Series] "Safety-Quick" Inspection Car

Here is a center load car for extra heavy service that one man can handle easily and quickly. It is specially equipped with extension lift levers, which reduce the actual lift to approximately 25% of the total car weight.

"Originated by Fairmont!"



Three-Bearing Ball-Bearing Crankshaft

Ball-bearing crankshaft supported on three bearings instead of two. Note how all pulley-over-hang is overcome by the third or end bearing (at right). Holds pulley in perfect alignment. Prevents crystalizing of steel shaft, and breakage. The only safe and wholly efficient crankshaft mounting.

SPECIALIZED knowledge of motor car manufacture gained from years of careful research and experience underlies every Fairmont improvement.

Every new feature before adoption must prove its fitness not only as a unit but as a perfectly coordinating part of the entire motor car assemblage.

Strict adherence to this policy has kept Fairmont far ahead in the development of safe, economical and dependable motor cars. And the list of items of motor car construction, "originated by Fairmont" grows steadily larger and larger!

FAIRMONT RAILWAY MOTORS, Inc.
Fairmont, Minnesota

DISTRICT SALES OFFICES:
New York Chicago St. Louis San Francisco Washington, D. C. Winnipeg, Canada

Fairmont

Ball-Bearing Engines and Railway Motor Cars

The Giant Track Liner

More Power Exerted in the Right Direction

Open Position

A Real

LABOR SAVER

at the Ratio of

7 to 2

TWO men using GIANT Track Liners will line as much track as **SEVEN** men following the old method of using lining bars.

FOUR men using GIANT Track Liners will line a switch or crossover. **FOURTEEN** men or more, if available, are generally used by the old method.

7
to
2

The GIANT Track Liner is made of cast steel. Completely assembled, it weighs less than 35 lbs. It has a footing base of fifteen by six inches and can be easily carried on section handcars or motorcars.

Manufactured and sold exclusively by

Gustin-Bacon Manufacturing Company

Kansas City **Philadelphia**

Write for further Information

A Necessity
Not a Luxury—

NOW USED BY MANY LEADING RAILROADS
BECAUSE IT—

Throws Without Lifting.
Clears a Passing Train.
Makes Track Lining Easy.
Requires Only One Seating. Releases Men for Other Work. Is Used in Any Kind of Ballast. Does With One Man the Work of Four Men With Bars. Concentrates Force for Lining Kinks, Switches, Etc. Enables Each Section Gang to Keep Its Own Track Lined.

The Rail Joint Company
61 Broadway New York

"RAJO"

Releases two men out of five for other work

Simplifies work of lining track

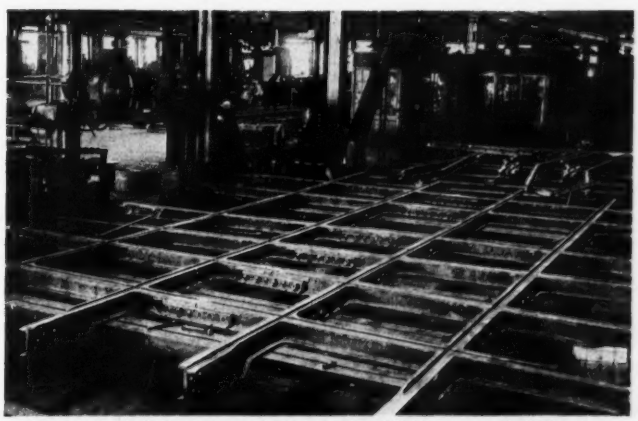
"RAJO" TRACK LINER

Taylor-Wharton Iron & Steel Co.

Wm. Wharton, Jr. & Co., Inc.

Tioga Steel & Iron Co.
Philadelphia Roll & Mach. Co.

TISCO



Section of Fabricating Floor Showing a Six Solid Manganese Steel Crossing Job for an Eastern Railroad

WHARTON

Wharton Trackwork

This company originated the use of Manganese Steel in trackwork; and the name TISCO now represents the generally acknowledged superiority of this alloy.

Tisco Manganese Steel, used exclusively in the trackwork manufactured by this company, is treated by the original Taylor-Hadfield process which for many years has demonstrated that it gives that combination of toughness and hardness so essential to maximum durability.

Our designs include those adopted by the American Railway Engineering Association as well as our own, and our facilities for the production of Special work, both for electric and steam railways, have been developed to meet every demand; the quality is jealously maintained.

Wm. Wharton Jr. & Co., Inc.
Easton, Pa.

RACOR

RAMAPO AJAX ELLIOT

SEVEN WORKS

HILLBURN, NEW YORK
NIAGARA FALLS, N. Y.
CHICAGO, ILLINOIS
EAST ST. LOUIS, ILL.
PUEBLO, COLORADO
SUPERIOR, WISCONSIN
NIAGARA FALLS, CANADA

MANUFACTURERS OF

HEAVY DUTY HEAT TREATED
GUARD RAIL CLAMPS
DROP FORGED RAIL BRACES
ADJUSTABLE RAIL BRACES
DOUBLE SHOULDER ROLLED SWITCH PLATES
MANGANESE REINFORCED SWITCH POINTS
RAMAPO AUTOMATIC SAFETY SWITCH STANDS
AJAX MANGANESE ONE-PIECE GUARD RAILS
SWITCHES FROGS CROSSINGS
SPECIAL RAILWAY TRACK WORK IN
OPEN HEARTH STEEL,
CAST MANGANESE AND ROLLED
MANGANESE RAIL CONSTRUCTION

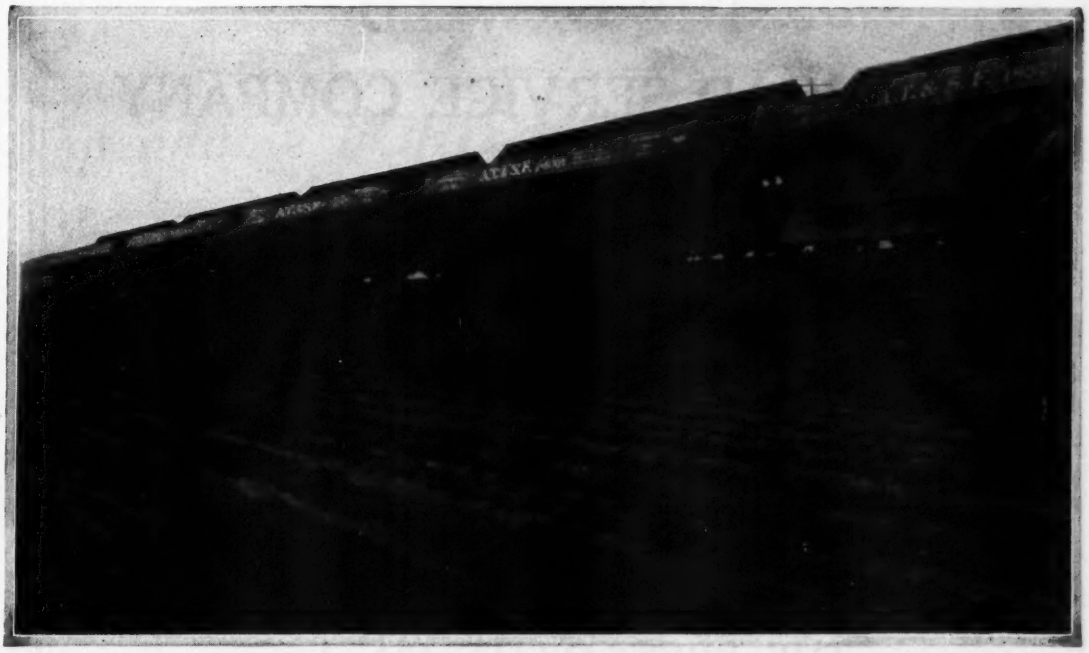
RACOR
TRADE MARK

MAIN OFFICE HILLBURN, NEW YORK

Sales Offices at All Works—Also
30 CHURCH STREET, NEW YORK
McCORMICK BUILDING, CHICAGO

Ramapo Ajax Corporation

Ask the Man Who Knows



Western cars in act of dumping partially frozen sticky river silt on the Santa Fe. Note distance material is thrown from first car. The camera man caught the loads while still moving from the remaining cars.

The only infallible guide for the selection of the most economical dump car installation is a comparative test. Find someone who has worked with them all and knows the facts—then install the car which the test shows will give you the most service at the least cost for maintenance.

When you know the facts you will install Western Automatic Air Dump Cars with aprons. Here are the facts:

Western Dump Cars are all-purpose cars—you can use them economically in maintenance, betterment, construction or merely hauling waste.

They are two-way dump cars, dumped by air instantly in either direction without previous preparation, placing the load where you want it when you want it.

The apron in dumping extends the floor 28 inches in order to clear the ballast.

They can be righted instantly by air without shoveling or moving up.

They have exceptional dumping power and are built with few castings greatly lessening your investment in repair parts.

Railroads installing these superb labor-saving Westerns are enthusiastic. May we refer you to them? Write today, please.

Have you received our new catalog? Send for R-61.

Western Wheeled Scraper Company

Founded 1877

Earth and Stone Handling Equipment

AURORA, ILLINOIS.

THE OXWELD RAILROAD SERVICE COMPANY

representing

THE LINDE AIR PRODUCTS CO.
(Linde Oxygen)

THE PREST-O-LITE CO., Inc.
(Prest-O-Lite Acetylene)

UNION CARBIDE SALES CO.
(Union Carbide)

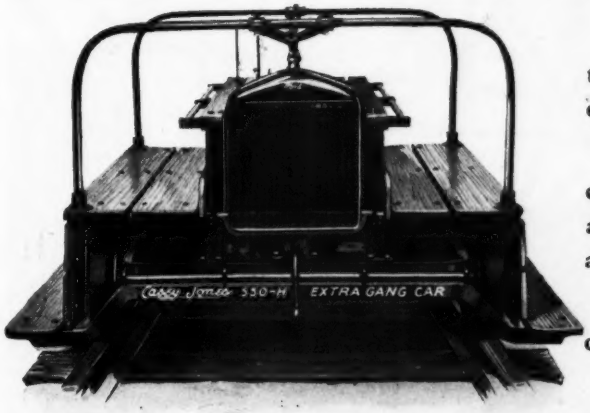
OXWELD ACETYLENE CO.
(Oxweld Apparatus and Supplies)

Railway Exchange
Chicago

30 East 42d Street
New York

facts and comments! by Casey Jones

Dependable FORD MOTOR performance—



CASEY JONES 550 H HUMP AND EXTRA GANG CAR

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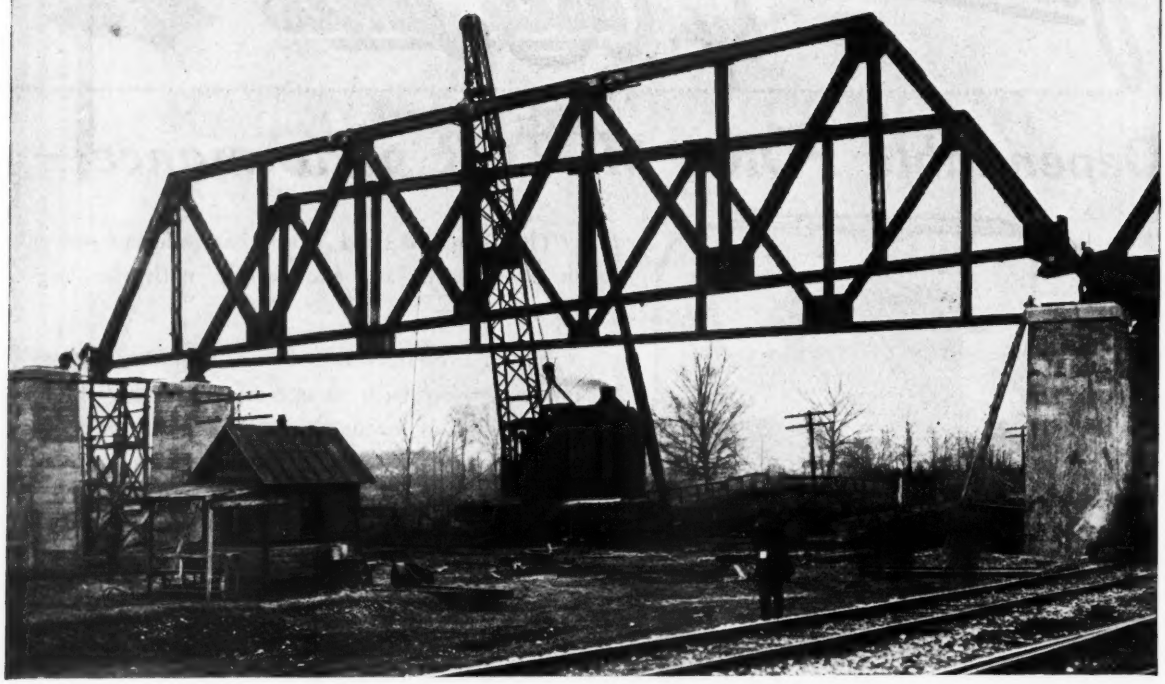

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The operator on No. 7 knows that he has positive control of his machine at all times. When setting a bridge span or when working at any of the ticklish jobs that are all in the day's work for the maintenance engineer, No. 7 obeys the slightest motion of the control levers.

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Railway Engineering and Maintenance

Volume 21 April, 1925 Number 4

PICK OUT THE BEST MEN

THE FACT that there is now an adequate supply of labor in most parts of the country and an actual surplus in certain territories was clearly shown in the review of labor conditions in the March issue. Later reports indicate that no particular change in the situation has occurred during the past month. But it is well to bear in mind that the early spring is a dull season in construction activities, and like railroad maintenance and construction, other outside operations called for the employment of common labor are generally delayed until favorable weather is assured. Highway construction, for example, does not open in full force until just about the time that the railroads usually enter upon their active season's work. For this reason, the increased demand for men will come from all quarters at about the same time, and while there is little likelihood of a shortage, this year, the best men will be hired first. Now is the time to recruit the most desirable men.

THE PROBLEMS OF THE BRANCH LINE MAN

IN AN EFFORT to improve the standards of the railways as a whole, it is worth considering whether attention is not being concentrated too largely on the high-speed, heavy-traffic main lines to the detriment of the branch lines. It is recognized, of course, that the main lines require more study in order that the cost of maintenance may be kept within reasonable limits in the face of the constantly increasing traffic. It is here that the heavier rail and the newer appliances find first application. It is here also that the larger gangs are required and labor saving equipment finds its greatest field. However, it must also be remembered that the typical railway of the United States and Canada is still a single track railway, for less than 15 per cent of the mileage of the lines in the United States and a still smaller percentage in Canada has more than one main track. Furthermore, the average line, main and branch, of these countries carries less than six trains each way daily.

More than half of the mileage of the country is what may properly be termed "branch line mileage" with relatively light rail, little or no ballast and not to exceed three or four trains daily. These lines must be maintained to fair standards, yet their earnings do not warrant the expenditure of any considerable amounts on them. Maintenance forces charged with the responsibility for their upkeep are, therefore, denied the advantages of the stronger track construction and of much of the labor saving equipment found on main lines and must get along as best they can with that which the road can afford to give them. These conditions impose special problems on railway officers, for the amounts spent on the maintenance of lines of this character are large in the aggregate. While *Railway Engineering and Maintenance* is devoted to the improvement of the standards of maintenance of lines of all kinds through the dissemination of information regarding improvements made in various parts of the United States and Canada, it does not desire to overlook the problems of the men on the branch line. Its columns are open to them and the editor welcomes suggestions regarding ways in which it can serve them better.

A CONCLUSIVE ARGUMENT

NO MORE conclusive argument for the treatment of ties can be made than that contained in the statement of tie renewals on the Atchison, Topeka & Santa Fe, published elsewhere in this issue. This road has been a pioneer in the protection of its ties from decay, supplemented by protection from mechanical deterioration. It first began the treatment of its ties in 1885 and has used treated ties exclusively for nearly twenty years. As the result of this practice, the number of ties treated has decreased consistently from 336 per mile of track in 1898 to 115 in 1924.

Even more striking because of the elimination of yearly fluctuations are the figures for the average number of ties renewed per mile of track per year for five-year periods. These figures have decreased constantly from a maximum of 286 in 1909 to 142 for the five years just closed. The value of this record to the Santa Fe is demonstrated by the fact that in 1898 with only 8,185 miles of track this road inserted 2,751,849 ties, while in 1924 only 2,046,054 ties, or over 700,000 less were required for the maintenance of 17,709 miles of track or twice the mileage of the earlier period.

A comparison with the requirements of other roads operating under similar conditions demonstrates that the Santa Fe has reduced its tie requirements in excess of two million ties annually. At prevailing prices and including the labor cost of replacement, this is yielding a handsome return on the investment made for protection. It is records such as this that are affording a great stimulus for the universal treatment of ties by all roads and is lending support to the opinion that the use of a tie untreated will soon be considered little less than criminal.

EXTEND WOOD CONSERVATION

THE BRIDGE engineer of a large western railroad recently reported that on one division on which pile trestles aggregate four track miles in length, not a single pile was driven during the last year. Thus there is afforded another of the oft-repeated demonstrations of what timber treatment is doing for the railroads, or to reverse the statement, what the railroads are doing, through preservation, for the conservation of our national supply of timber. The position of leadership which the railroads have gained along this line is an enviable one.

Nevertheless much must still be done before they can be said to have entirely reformed as regards the wasteful use of lumber.

The reason for this is thoroughly apparent. The prevailing high standard of practice in the preservative treatment and care of timber used in railway tracks, bridges and trestles, is the result of years of investigation and experiment, combined with intensive educational campaigns to acquaint the users of cross ties and bridge timbers with the wastes attending the application of untreated wood and the precautions which must be taken to secure the maximum life from treated timber. Outside of these two specialized fields the economics of wood conservation appear to be a closed book.

It is true that there are definite limitations on the use of treated wood in buildings, but there is room for much improvement in the prevailing practices in the use of untreated wood which would minimize the decay that occurs in certain parts of wooden buildings. Too many cases are still encountered where wood blocks are used for mud sills under small structures, where stair stringers come in contact with moist ground, or where joists or posts are embedded in concrete walls or pedestals.

Such practices on the part of the house building contractor may readily be ascribed to ignorance. But this explanation or excuse cannot be offered for improper practices in building construction by the railroads, for surely the officers in charge of building construction should be thoroughly acquainted with the causes of decay in timber and the measures necessary to prevent it. They should know that decay is caused by wood destroying fungi and that certain conditions are favorable to their growth. Furthermore, they should know that even for those common uses of wood which preclude chemical treatment certain construction practices may be observed in the use of untreated wood which will reduce, if not entirely eliminate, the danger of decay. Briefly, these prescribe that every measure shall be taken to protect the timber from the continuous presence of moisture or to insure necessary ventilation which will effect the complete evaporation of such moisture in the shortest possible time.

The consequences of the deterioration of wood in buildings as a result of decay are not set forth in the form of large annual renewals such as result from the decay of ties and wooden trestles. On the other hand, the added expense for preventive measures in building construction is inconsiderable as compared with the cost of the wholesale treatment of ties and bridge timbers. In other words, while the economies to be effected by improved practice are not as large, the added cost of such improvements is also proportionately smaller. Is this not another field for the conservation of our national timber supply in which the railways can be leaders.

WHERE DO WE GO FROM HERE?

The man who starts on an extended trip without having a destination clearly in mind and who tarries along the way seldom arrives anywhere. The same is true of the force whose efforts are directed by one who is working without a plan. That foreman who takes his gang out in the morning without a definite task or series of tasks in mind will putter all day and return at night without having accomplished anything worthwhile.

The season of active work is now opening. The year's major improvement program is before us. It is large. To be conducted with the maximum efficiency it should be started at the earliest possible date and carried on continuously throughout the season. Every task should follow in sequence. There should be no hesitation in determining what work should be undertaken when any task is completed, for each step should be clearly mapped out in advance.

That supervisory officer will secure the greatest efficiency from his force and the greatest return for the money expended who aids his foremen in developing their programs and in adhering to them, in order that there may be no occasion for foremen or men to raise the question mentally, if not audibly, "Where do we go from here?"

THE REQUIREMENTS OF A MOTOR CAR

WHEN a railway undertakes to select a motor car for a particular type of service it faces two conflicting requirements. On the one hand, the car must be sufficiently strong to stand up under the service for which it is selected; while on the other hand, it must be as light as possible consistent with this strength in order that it may be handled without undue exertion.

At present there is little agreement among the manufacturers in the classification of their cars as between those designed for inspection, section and gang purposes. There is likewise no agreement between the railways regarding their requirements. One road desires a section car for branch line use which can be operated safely by two men. Another desires a section car to carry eight or ten men and their tools. The result is the continued purchase of cars which are too light to stand up under the service required of them, which leads to their premature breaking down under constant overloading. This condition has become so pronounced that some manufacturers have been forced to redesign and strengthen what they had originally intended to be one-man cars so that they can carry section gangs because they have found it impossible to prevent the roads from using them for heavier service than that for which they were intended.

The motor car has developed to the point that agreements as to terminology and classification are needed. The period of experimentation and determination of requirements has passed and the roads should now be able to agree upon the minimum requirements which they demand of cars for the various classes of service. The magnitude of the investment in motor cars is sufficiently great to warrant the American Railway Engineering Association undertaking this study. Upon its completion the manufacturers will be in a position to build cars to meet requirements which are generally accepted and competition will be on a more equitable basis.

THE THIRTY-NINE FOOT RAIL

THE 39-FT. RAIL is now here to stay. It is rapidly replacing the 33-ft. rail just as it in turn replaced the 30-ft. rail and the 28-ft. rail of earlier years. Two years ago the 39-ft. rail was the topic of active discussion between the more progressive railway engineers and the manufacturers and the few roads which ventured to ask for it were confronted with an added charge for handling in the mills. Last year the Southern Pacific placed orders for a large tonnage of the longer length without payment of a premium and a few other roads made similar contracts. This year the large proportion of the rail under order is of 39-ft. length and the mills are accepting specifications for this length freely and

without any suggestion of a premium. Thus another development in maintenance practice is being brought to a successful conclusion.

This measure was made possible by several other developments in railway transportation. In the first place, it is a reflection of the increasing length of equipment which is now available for the transportation of the rails from the mills to the points of use. It is also an indication of the fact that the weight of individual rails is no longer a serious deterrent to their handling in track because of the development and increasing use of equipment for the handling of these rails, even to the point of actually placing them in position in the track. The bogey of overcoming expansion is also dissipated by the fact that the track construction has been increased in strength in all respects to the point where buckling in hot weather is no longer to be feared on tracks otherwise adequately maintained.

The desire for longer rails is prompted by several considerations. In the first place an immediate saving is made by reason of the reduction in the number of joints, thereby permitting the roads to give more consideration to the selection of better types of joints while still effecting a reduction in cost. Since the joint is of necessity the weak point in the track, the reduction in the number of joints also creates a more uniform condition of maintenance, reduces the number of joints to be maintained and promotes a more uniform riding track. The adoption of the 39-ft. rail is another mile stone in the improvement of maintenance of way practices.

QUANTITY VERSUS QUALITY

THE DISCUSSION of quality and quantity presented on another page of this issue raises a point that will become increasingly important in track maintenance as more scientific methods are put into practice. Under prevailing policies, the measure of a section foreman's efficiency is the general condition of his section—the riding quality of the track, the neatness of the ballast section and grass line, the extent to which weeds have been removed, the condition of the fences and ditches, etc. In other words, he is judged on a quality basis, although this depends largely on the quantity of work his gang has completed during the season.

But with an increased use of labor saving devices it becomes necessary to pay greater attention to the direct quantitative result. For example, if a foreman is given a tie tamping outfit to use for a certain number of weeks, it is not enough to measure the results he obtains with this equipment by the general condition of the track surface on his section. To obtain the investment in such machines, records must be kept which show how many feet of track were surfaced or how many joints were raised, and how many days the tamper was in actual use. The keeping of such records naturally leads to competition between foremen in securing the maximum output or quantity of work completed in a given time. This means that the foreman will be more inclined to think of his responsibilities in terms of output of work rather than in terms of the result—the general condition of his track—and it has been found, where such competitive systems are followed, that some foremen will slight the work in order to make a good showing.

The usual method of meeting this situation is for the supervisor to require defective work to be done over, not alone to have it done right, but also for disciplinary effect, because the foreman who has had his record for production spoiled by being required to spend several days on work that will not count on his output report, will be more careful to do his work more thoroughly.

Letters to the Editor

FOR A YEAR-ROUND SECTION FORCE

Ruston, La.

TO THE EDITOR:

In *Railway Engineering and Maintenance* for February the question was discussed of doubling up section gangs to do certain work after having reduced the regular section forces to such an extent that it would require three or four gangs to unload a car of crossties. One thing that seems to receive little consideration is the fact that you have to lay off more men from a section gang to save a dollar than from any other force. This leads to a condition which in many cases is expensive, rather than economical. A derailment in the winter months, for instance, is much more expensive than in the summer and there is more danger of bad wrecks from rail failures. In case a foreman has a broken rail and only one or two men to help him it might well be asked if he would consider it safe to put torpedos and red flags in both directions and then proceed to change out the broken rail, or whether he should flag one way himself and with one man flagging in the other direction, hold up the traffic until two or three gangs could come and assist him.

By using less of the allowance during the summer in order to have a standard gang the year round, conditions of this kind would not arise. Some work cannot be done in the winter but plenty of work is done in the summer which could be postponed until the winter months. To do this would let section foremen keep men who understand the work and not require them to break new men in every month or two. My experience with section labor is that a good man wants to work every day and if the gang is going to be cut to one man for three months in the year, the foreman has only one good man with him the year around. It appears to me that in cutting forces some other side of the block should cut than the section gang.

D. D. GAY,
Foreman, Chicago, Rock Island & Pacific.

LOOK AFTER YOUR MOTOR CAR

Parsons, Kan.

To the Editor:

The reading of the editorial on motor car maintenance apeparing in the January isue of *Railway Engineering and Maintenance* has suggested certain thoughts concerning this important subject. I have had a great deal of practical experience with motor cars. While I thoroughly believe in them and feel that they will soon entirely supercede hand cars I am convinced that there is still room for improvements in their design and construction, particularly with a view to making them easier to start in cold weather. I know of nothing more trying to a man's temper then to try to start a balky motor car some morning when the temperature is about 10 degrees above zero.

Of course, trouble of this kind happens more frequently on a car that is not in good condition. Here on the Missouri-Kansas-Texas we have a motor car maintainer on every superintendent's division who inspects every motor car on the line as he goes over his district and makes such adjustments or repairs as he finds necessary. I also find that it helps to have one man in my gang operate the car and look after it. He is therefore in a position to know when the car needs attention from the maintainer or requires repair

parts. The attention which he gives to the car may take him away from the gang for a few minutes from time to time, but I think that this pays.

There are many reasons for the popularity of the motor car on the railroads. A gang that has a car cannot only travel farther to and from its work but the men feel much more like working after a motor car ride them they do after they have pumped the hand car from four to six miles. The use of the motor car for handling push cars loaded with material saves the time of several men in pushing the car by hand. With further improvements the motor car will become even more useful.

W. SPRENGER,
Bridge and Building Foreman, Missouri-Kansas-Texas.

STEADIER EMPLOYMENT FOR ENGINEERS IN RAILWAY SERVICE

East Orange, N. J.

TO THE EDITOR:

During the present year more construction work will probably be done than in any one year since the war. To carry on this work many roads will have to rebuild their engineering organizations, which were almost depleted during the period of depression. In this rebuilding would it not be well for them to give some thought to providing more permanent employment for their engineers? There is much that can be done during periods when construction is slack, such as location work, preparing plans and estimates for future improvements, or even work in other departments for a time. In this way there would always be trained men available when needed.

The experience of the writer has been that nearly every large piece of construction work is started with almost an entirely new organization which it takes time and money to train. Many valuable men are let out at the completion of construction who seek more permanent employment in other lines and never return to railroad work. More permanent employment would also serve as an inducement to young men to enter the railway field upon graduation from college.

W. E. TENNYSON.

New Books

History of the Portland Cement Industry in the United States. By Robert W. Lesley, first vice-president, Portland Cement Association. 330 pages. 6 in. by 9 in. Illustrated. Bound in cloth. Published by International Trade Press, Chicago.

Mr. Lesley prepared this book with the co-operation of John B. Lober, president of the Vulcanite Portland Cement Company and George S. Bartlett, Universal Portland Cement Company, as the members of a "Committee on History," appointed by the directors of the Portland Cement Association, to develop the records of the origin and growth of this important industry during the first century of its existence. The subject is treated in regular sequence, commencing with a brief account of early efforts at the development of hydraulic cements, followed by a chapter on natural cement and then launching into a narrative of the discovery of Portland cement 100 years ago. Then follows an account of the beginning of the industry in America, presented very largely in biographical form to show the parts played by various of the early manufacturers in this country. The remainder of the text is topical, dealing in turn with the development of the industry from the scientific, mechanical and commercial standpoints, covering such matters as the development of equipment to manufacture cement in quantities commensurate with the demand, the standardization of quality through the adoption of standard specifications and the origin and growth of the Portland Cement Association. Considerable space is given to the activities of this organization and the administrations of its various presidents. The volume also contains an appendix in which short statements are presented relative to the corporate history, personnel, manufacturing capacity, etc., of each of the cement manufacturing companies.

Proceedings of the Forty-Second Annual Convention of the Roadmasters' and Maintenance of Way Association of America. 173 pages. 7 in. by 9 in. Bound in cloth. Published by the Association. T. F. Donahoe, general supervisor of road, Baltimore & Ohio, Pittsburgh, Pa., secretary.

This volume conforms in style and contents to its predecessors, being the report of the convention of this association held in New York on September 16, 17 and 18, 1924. The Roadmasters' Association has made marked progress in the last 10 years, a fact which is attested by the contents of the latest volume of proceedings. This is apparent not only from the calibre of the reports presented by the association's committees and the standing of the men who presented papers before the convention, but is indicated also by the spirit of co-operation manifested by the railway managements in lending their support to the affairs of this association and its convention, the program including addresses by R. H. Aishton, president of the American Railway Association and W. G. Besler, president of the Central Railroad of New Jersey. The subjects covered in this latest volume of the roadmasters' proceedings included such topics as work trains, the disposal of cinders, rail laying and ballasting, methods of handling labor, winter track work, etc.

Detailing and Fabricating of Structural Steel.—By F. W. Denser, engineer, Gary plant, American Bridge Company, 512 pages. 6 in. by 9 in. Bound in cloth. Published by the McGraw-Hill Book Company, N. Y. Price $5.00.

This book consists of a detailed outline of instructions to draftsmen and designers employed in the drafting rooms of steel fabricating plants. The first chapters cover the organization and routine methods of conducting the designing and detailing in a drafting room. The larger part of the book comprises a description of the various processes involved in the transformation of plates shapes, and bars into the fabricated material, covering such features as marking, shearing, punching, riveting and shipping and explaining just how the work is done, the kind of equipment used and the limitations on the methods employed which must be observed in the working out of details on the drawings. In addition, certain chapters are devoted to special forms of construction such as bridge work, office buildings, bridge machinery, tank work, etc. While in the main this book is intended for the engineer in the employ of bridge companies it contains a large fund of information of value to the structural engineer in the employ of the railroads as well as those other engineers whose duties require them to be conversant with the requirements and limitations of structural steel fabrication. The reading or reference to this work will be fruitful in obviating attempts to have work done in an impractical way. The book is gotten up in an attractive form and is well illustrated with many specimen drawings and sketches of structural steel work.

An Upstream View Showing the Quarry Site and Dump in the Background and a Steam Shovel in the Foreground

Pennsylvania Constructs Large Dam To Insure Water Supply

Completion of Work at Tipton Practically Doubles Storage Capacity in Altoona District

By Charles Haydock
Formerly Engineer, P. R. R. Water Companies, Philadelphia, Pa.

THE RECENTLY completed Tipton dam near Altoona, Pa., is the most important improvement to the Pennsylvania's water supply system which has been made in the last 15 years. This dam was built by the Tipton Water Company, which is a subsidiary of the Pennsylvania Railroad.

The importance of this addition to the railroad water supply in the Altoona district is indicated by the fact that at the present time there are five reservoirs, holding 430 million gallons of water, while the new Tipton dam alone will store 355 million gallons of water, or 80 per cent of the present combined storage. As a result of this, the danger of a water shortage in the Altoona district will be greatly reduced in the future. With the new dam in service the total quantity of water stored in the district for railroad uses is 785 million gallons, or enough to last about 90 days without any water flowing into the reservoirs.

Water Shortage at Altoona

In 1903, there occurred one of the most severe droughts ever recorded in Pennsylvania. It was almost impossible to secure enough water to operate the railroad in the Altoona district, even though many water trains were run daily. As a result of this extreme water shortage, the rights of the Tipton Water Company were acquired and shortly after a small intake dam on Tipton Run and a 16-in. pipe line to Juniata were built. The construction of a large storage dam was contemplated at that time, but was later deferred, owing to the magnitude of other water supply improvements then under way. The drought of 1922 emphasized the need for a large storage dam and the project was revived and promptly authorized. As authorized, the work comprised a main storage dam on Tipton Run, a diverting dam on a smaller tributary called Loup Run, and a pipe line to divert the water from this into the main reservoir.

Tipton Run is one of the purest mountain streams in the vicinity of Altoona. The company owns 8,000 acres of land, comprising most of the watershed of the stream, and the continued purity of the stream is therefore assured. The watershed is almost entirely covered by a young growth of forest trees. Tipton is about 10 miles east of Altoona and the dam is being constructed at a point approximately 3½ miles up the valley from the main line of the railroad. The drainage area of Tipton Run at the site of the dam is 8.2 sq. mi., and of Loup Run at the site of the intake dam, 3.2 sq. mi., so that by means of this dam it will be possible to impound the water flowing from a total of 11.4 sq. mi.

The contractor's first work was to rebuild the Tipton Railroad which formerly ran up the valley to the dam site but had been abandoned for 20 years; practically all of the ties and bridges were renewed, broken rail replaced and the track lined, etc. After the railroad had been rebuilt a camp to house the workmen was constructed. Following this, various construction buildings were erected and the equipment moved in. It was then possible to begin work on the main dam. The first step was to remove all the soil and loose rock from the site. The solid rock was then excavated for a depth of several feet in order to give a proper foundation in solid rock. In order to increase the holding qualities of the dam, a wide trench was excavated near the downstream face, and the main body of the dam was built into this trench or key. To reduce further the danger of leakage occurring under the dam, a cut-off trench 5 ft. wide and 15 ft. deep was excavated in the solid rock at the upstream toe.

Most of the excavation in the cut-off trench was made by using a channelling machine, which makes a clean cut. This is a set of three drills, bound together, that work up and down and at the same time, move along instead of rotating, as the ordinary single drill does.

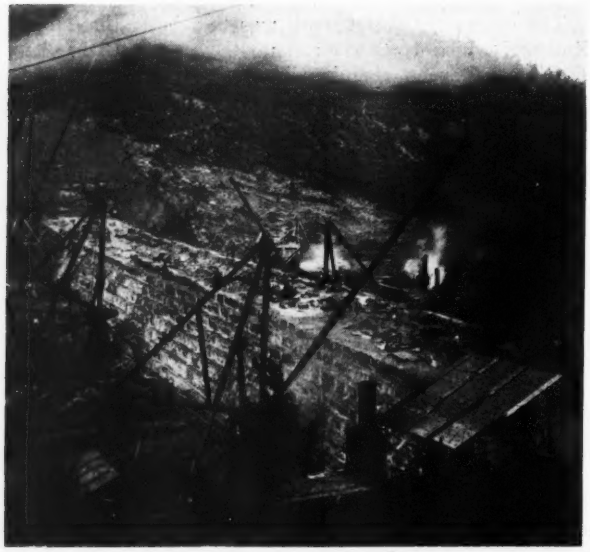
The whole machine is mounted on a carriage that operates on tracks placed along the trench. While this is often a slow process, it is a very safe method and makes a perfectly clean cut. Only a single channel cut was made, this being the downstream face of the trench. After the channel was cut, holes were then drilled a

Digging the Trench for a Cut-off Wall at the Upstream Toe of the Dam to Prevent Leakage Under the Dam. The Pipes in the Trench Were Used to Force Cement Grout from the Mixing Machine, Shown at the Right, into the Cracks in the Rock Below

few feet upstream and the rock blasted out in the ordinary manner. In this way the cut-off trench excavation was made without danger of opening up seams in the rock by the force of the blasting.

With the preliminary work of excavating the heel and cut-off trenches completed, it was then possible to start work on the main dam, which is a solid concrete and masonry structure of the gravity type.

In order to start work on the body of the dam the foundation was prepared for the full width at the bottom and, in addition, all material down to bed rock was removed for some distance downstream from the main dam. At the lower end, a low concrete wall was built across the valley and the natural rock was protected by masonry paving to form a stilling pool four feet deep where water and ice passing over the dam may fall and their force be broken without possibility of damaging the dam and also so that the water may be started downstream uniformly without eroding the channel.



The Dam was Built with Stone Facing Backed with Cyclopean Concrete

Grouting the Cut-off Trench

In the bottom of the cut-off trench a series of holes were drilled 10 ft. apart and 20 ft. deep. Pure cement grout was then pumped into these holes until all the crevices in the undisturbed rock foundation were filled, and it was impossible to force in any more grout. After these holes had been drilled across the entire foundation, intermediate holes were then drilled to the same depth and an effort made to grout these.

In most cases it was found that very little grout could be forced into the intermediate holes, indicating that the grouting of the original holes had been very successful. The effect of this grouting is to extend an impervious curtain into the undisturbed rocks to at least the depth of the drill holes. In some places, by reason of the depth of the excavation for the main dam, the depth of the cut-off and the depth of the drill holes, it is believed

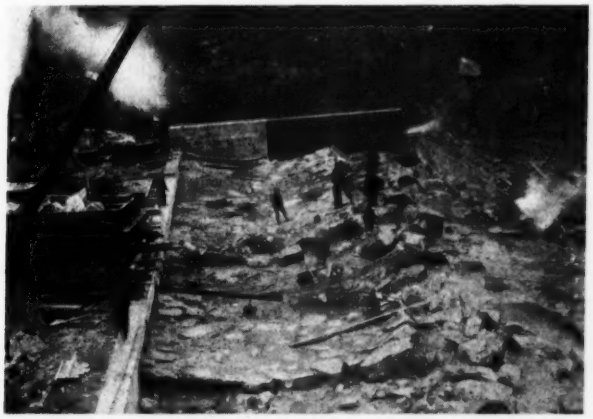
A View of the Dam While a Flood Interrupted Operations

the valley has been sealed against the possibility of water flowing through the rocks for a depth of 50 ft. below the natural surface of the ground.

After all of this drilling and grouting has been completed, it was felt desirable to make a further test, so that arrangements were made for drilling a series of 10 diamond drill holes across the valley to a depth of approximately 75 ft. These were afterwards grouted and it was found that very little grout could be forced into them, indicating that the preliminary grouting had been very successful.

The cores taken from the diamond drill holes indicated that the foundation was largely of hard, close-grained sandstone, with some layers of shale. There were a number of seams encountered, but the rock was continuous and without crevices. The information obtained in all of the drilling operations during the construction period fully confirmed the first opinions that the Tipton Valley at this point was a very favorable location for a large masonry dam. Some years before the dam was built, two diamond drill holes, each 250 ft. deep, had been drilled at the site of the dam and these showed the same kind of rock for their entire depth.

In order to assure a perfect bond between the concrete and the rock faces, it was necessary to remove all loose and foreign material. To accomplish this the rock faces were actually scrubbed with wire brushes and water. Then while still wet these rock faces were covered with pure cement grout as a further aid to bonding. The trench was then ready to receive the concrete. This was placed as nearly continuously as possible and no joints were left. Wherever fresh concrete was placed on a surface that had already set, the hardened surface was cleaned in the same way as though it was a natural rock surface.



A Stilling Pool Was Built on the Downstream Side of the Dam as a Protection from Scour

The wide trench near the downstream face of the dam was treated in a similar manner, the only difference being that many large stones were placed in the soft concrete in this trench, forming what is technically called cyclopean concrete. The effect is to increase the weight, and therefore the density of the structure, and at the same time reduce the amount of cement required.

Building the Dam

After the masonry paving for the stilling pool had been laid and the two trenches filled it was then possible to proceed with the construction of the main body of the dam. Below the ground line, concrete alone was used. Above the ground line, the exposed faces of the dam were built of rubble masonry. The stone comprising this masonry was of the largest size which could be handled by the equipment.

To start the main dam, concrete was deposited in forms up to the ground level. Above this point the rubble masonry facing was laid in courses approximately three feet high. In many instances this was a single stone, and some of the stones were as much as eight feet long. This masonry was laid with mortar joints in the customary manner. After these walls had been built the intervening space, comprising the body of the dam, was filled to the top of the course with cyclopean concrete.

The general plan was to start the masons at one side of the valley and work across, one gang working on each wall. The concrete gang followed as soon as the mortar joints in the masonry had set. This process was followed as far as possible, course by course, from the bottom to the top. It sometimes happened that the foundations at the sides of the valley were not fully prepared, so that at times the dam was higher in the center than at the ends. It was also necessary to vary the general plan with respect to the point where the stream was carried through the dam.

The Diversion Dam on Loup Run for Use in Diverting the Flow of This Stream into the Tipton Basin When Desired

Shortly after the work was started a new channel was excavated and the stream directed to one side of the valley. This permitted work over almost the entire bottom of the valley. After the concrete in this section had been carried up some distance a flume was built to carry the stream. The foundation for this end of the dam was then built and the concrete deposited up to the level of the bottom of the valley. Pipe lines of 24-in. and 36-in. diam. were then laid through the dam side by side and concreted in solidly. The 36-in. pipe line is the waste pipe or blow-off from the dam, while the 24-in. pipe is the service line which carries the water through the dam and connects with the pipe line leading to Altoona. As soon as the 36-in. line had been laid the run was diverted through the pipe and the flume was removed.

The closing of a masonry dam in this way is one of the most critical periods of construction, but in this case it was accomplished without any difficulty. After the closure had been made this section was carried up to a level with the rest of the dam as quickly as possible.

The Completed Dam from the Downstream Side Showing the Partially Completed Gate House at the Right

The top of the dam is a coping composed of pre-cast blocks of reinforced concrete. The center of the dam contains a spillway section 150 ft. long and 4 ft. lower than the rest of the dam.

Piping and Controlling Valves

Provision was made in building the Tipton dam to take water at three different levels. This was done by building a vertical 24-in. pipe in the masonry with outlets on the upstream face. These outlets are controlled by sluice gates and protected by heavy racks, in order to keep debris out of the line.

The gate house, which contains the controlling valves, is located a short distance below the main dam and is built of the same stone as the dam. The valves and other required equipment are in the basement, while the upper portion of the structure is for use as a store or

The Water Stands 69 Ft. Deep at the Spillway Which is Shown at the Center of the Dam

tool house. The main valve controlling the blow-off from the reservoir is in this gate house. It is an hydraulic valve, operated by means of a piston, working in a cylinder.

In order to make sure that no leaves, sticks or other undesirable objects enter the pipe line, two screen pots were placed in the gate house. These are simply small tanks with screens in them, through which the water passes. These screen pots are so arranged that one can be cleaned while the other is in service. A large water meter was also placed in the gate house to measure the quantity of water withdrawn from the dam.

Loup Run Intake

As a part of the Tipton project, a small concrete intake dam was built on Loup Run, a tributary of Tipton Run, entering the main stream a short distance below the Tipton dam. This intake is a solid concrete structure built on a substantial shale foundation. It does not impound much water, as its function is solely to divert the flow of Loup Run into a pipe line which conveys it around the nose of the mountain into the Tipton dam.

An intake chamber, with rack and screen, was built above the dam to prevent leaves and debris from entering the pipe line. The line carrying the water from the Loup Run intake to the Tipton dam is of reinforced concrete pipe, cast in 8-ft. lengths and having bell and spigot joints. It was carefully laid to a uniform grade, so that if the water is shut off at the Loup Run end all of the water in the pipe line will drain into the Tipton dam. This concrete pipe line is about 4,300 ft. long and is of such a size as to carry practically all the flow of the run.

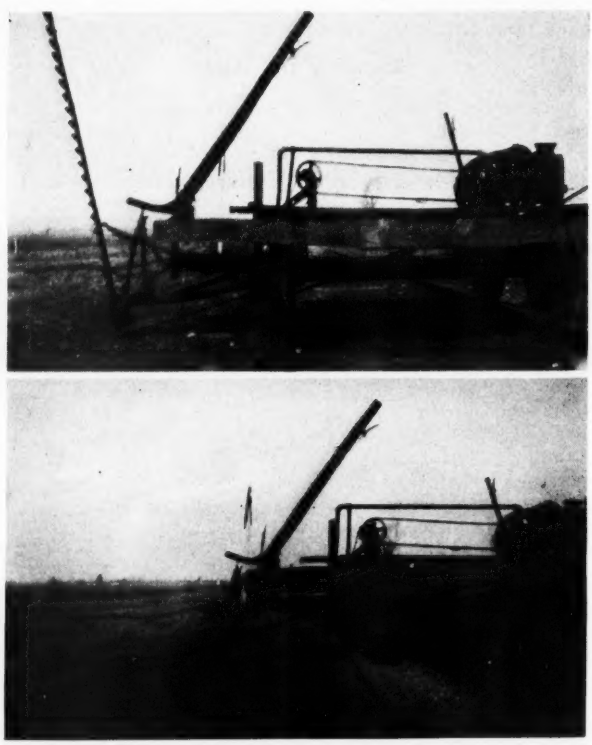
Construction Organization

The entire project was designed and carried out by the water company's organization of which W. B. McCaleb is general superintendent. The preparation of the designs and the specifications was handled by the writer who was also in general charge of the work. The field work was directed by Crosby Tappan, resident engineer. J. W. Ledoux, Philadelphia, Pa., was retained as consulting engineer. The contractor was A. L. Anderson & Bros., Altoona, Pa. The total cost of the work was approximately $600,000.

A Home Made Weed Mower

By L. Coffel
Supervisor, Chicago & Eastern Illinois, Momence, Ill.

EARLY last summer a chance to get an old McCormick mower caused me to try my hand at building a mower for cutting weeds and grass along the tracks of my subdivision. I dismantled the old mower by taking off the tractor wheels and tongue, after which I took it to our shops at Momence and had some of the heavy iron parts cut off with the acetylene torch, retaining only such portions as I needed for mounting the machine on a push car. As seen in the photograph, the machine is operated by a three-horsepower gas engine with a belt drive to a jack shaft from which the machine pitman is driven by means of a chain drive. The engine, as well as the gears, the drive shaft and the cutting bars,



Two Views of the Home Made Weed Mower with the Sickle in the Raised and Lowered Positions

are all mounted in a frame made of two-inch tubing which was picked up from the scrap heap at the shop.

The sickle and cutting bar are six feet long and the machine has been mounted in such a way that the position of the cutting bar may be adjusted so that a six-foot swath may be cut with the inner end within 18 in. of the ends of the ties or so that the outer edge of the cut will be 12 ft. from the nearest rail. It is also arranged so that the cutting bar may be readily raised or lowered for high or low banks by means of a lever which is operated from the bed of the car. One man is required to handle this operation and also to see that the sickle is not run into the bank or obstacles along the track and it will readily clear any obstruction six inches above the top of rail. The arrangement is such that the machine can be operated only on one side of the track. The push car must be turned around in order to cut along the other side of the track. The weight of the push car with the equipment in place is about 900 lb. and the car can readily be turned around at road crossings.

The original plan was to operate the machine by pushing it along the track by hand. However, after getting it set up and making a trial it was found to operate with such ease that we now use a motor car to provide the power for propelling it. The results obtained have been fully up to expectations. It has been operated at a speed of as much as three miles per hour and can be depended on to operate satisfactorily at an average speed of two miles per hour. A crew of four men and a foreman are required to handle the complete outfit.

The Use Of Heavy-Duty Motor Cars Eliminates Work Trains*

By M. D. Carothers

Assistant Engineer of Maintenance, Baltimore & Ohio Chicago Terminal, Chicago

ON A BUSY terminal like that of the Baltimore & Ohio Chicago Terminal, with limited space for the storage of material and these locations several miles apart, and with no local freight or passenger train service, it is necessary to get some means of delivering the materials required for work along the line. Formerly, this material was handled either by hand car or work train. This proved very expensive as it took a large part of the day to get material where it was to be used or to get cars set and billed to the various sidings.

The result has been to develop the use of motor car trains for this service. The cars which the Baltimore & Ohio Chicago Terminal now uses have 35-hp., gasoline-driven, truck type motors, friction driven to both axles, giving speeds ranging from 2 to 30 miles per hour in either direction. The wheel base of these cars is 9½ ft. The steel frame is carried on 2½-in. non-insulated steel axles with 2¼-in. tapered-tread, pressed-steel wheels with double-riveted hubs. There are no loose wheels. The hand lever brakes are similar to those on hand cars but of larger size. The lighting on these cars is kerosene using a car inspector's lantern for a head light and standard railroad markers for rear lights.

Each of these cars is provided with two trailers or push cars of a special heavy type with wooden frames but with the same type of wheels and axles as on the motor cars. They have a capacity of five tons each. The coupling between the trailers and the motor car is effected by means of a specially constructed drawbar composed of a solid rod inside a coil spring which is housed by a three-inch pipe. This arrangement permits the ready starting of heavy loads.

The carpenter forces use these cars to move all classes of material from yard to place of use for in this terminal district only a small amount of material can be left at the site of the work on account of theft. Once each month they mount a ladder on a push car and repair all bridge warning signals.

The track department uses these cars about 60 per cent of the time in handling material to the various sections from centrally located material yards or storage points. In handling cross ties, the two truck cars are spread apart and two 30-ft. 60-lb. rails are laid from one car to the other. This provides a 30-ft. flat car that will carry from 100 to 110 main-line ties or from 150 to 160 side-track ties. With a crew of six men these motor car trains handle as high as 1,400 ties in one day of 10 hours at an average cost of 2 cents per tie, as against a cost of 4½ cents per tie if handled by work train. In handling rail these cars will haul 25, 80-lb. 33-ft. rails at 14 miles per hour. All small track material used in the maintenance of way department that is not handled by the supply train is secured from the storehouse and delivered to the section needing the extra material.

A Motor Car Train Hauling Ties

The signal and bridge departments use these cars to handle small amounts of screenings and stone for concrete work around interlocking plants, bridges and buildings, where less than car load lots are required. These cars are also used in moving gangs from one location to another. Twice each month, these cars are used to pay the sectionmen, interlocking men, towermen and crossing watchmen without loss of time to the men. This also eliminates the expense of running a pay car with a saving

*Report of paper and discussion presented at a meeting of the Maintenance of Way Club of Chicago on March 17, 1925.

of just about $200 per month for this one item alone.

The crew used to operate one of these cars consists of an operator and one helper. The operator when occupying the main track is under train orders. The motor car must clear all trains in sidings or yards, as the weight is too much to set it off at any road crossing.

There are two of these heavy duty cars on this terminal. One car is located in our downtown district, the other at Blue Island at a point where our lines run four ways. The operator in charge of these cars report to the carpenter foremen at their respective points. The foremen keep in direct touch with the chief dispatcher and the office of the engineer of maintenance so that in case of emergency, men or materials can be dispatched without loss of time.

During 1924 these cars traveled 17,169 miles, making 5.6 miles per gallon of gasoline and 24 miles per pint of oil. The maintenance on each of these cars and trucks averages about $150 per year per outfit.

Discussion

F. M. Condit, Fairbanks Morse & Co., said that Mr. Carother's paper raised a point which has long been a source of perplexity to the manufacturers of motor cars. The cars described by Mr. Carothers are designed to carry heavy loads and are not intended to be lifted off the track to clear trains. The real problem arises with respect to the general service car. The manufacturers would like to know just what the railroads consider the requirements for such cars to be. Should they be designed primarily for the handling of men with the weight kept within such limits that they may readily be removed from the track to clear trains, or is it desired to have cars heavy enough to handle considerable quantities of material, which necessarily involves putting considerable weight into the cars, thus increasing the difficulty of removing them from the track? This also raised the point of the overloading of cars. The manufacturers, he said, are frequently involved in trouble because the railroads purchase one-man or two-men cars and then use them for more severe service than that for which they were designed.

I. H. Schram (Erie) said that he prefers a car equipped with a free-running engine since a car so equipped is much more effective in hauling heavy loads. He said that he had found motor cars of great convenience in handling extra gangs on rail renewal work since their use enables the men nearest the work to get on the ground much quicker than if they are compelled to wait until the work train arrives after having picked up men located at a greater distance. He said also that a motor inspection car was greatly to be preferred to an inspection train as it can start and stop quicker and requires less room on sidings or spurs to clear the main track than is required for a train.

G. P. Palmer (B. & O. C. T.) presented some supplementary facts concerning the motor car material hauling service described by Mr. Carothers. He stated that with telephone train dispatching and contact points not more than five or six miles apart the operators of the motor cars had no difficulty in using the cars without causing delays to regular trains. No train accidents have occurred and by the issuance of instructions to crossing gatemen to close crossing gates for the cars and by equipping the cars with automobile horns the operation of the cars is being conducted with a singular freedom from grade crossing accidents. One point which he wished to stress particularly is the saving in time effected in getting the motor car trains into the clear. Owing to the fact that it is relatively short as compared with a locomotive and a string of cars, it is possible for the motor car to clear the main line at almost any point where a few feet of track are available on an adjacent industrial siding. Experience with regular work train service shows that 25 per cent of the time is often expended in clearing trains.

Emil Rost (B. & O. C. T.) pointed out that the motor cars used for distributing material on the B. & O. C. T. should not be confused with the section cars which, he said, should be used only to handle light material and should be of such weight that they can be readily removed from the track by one man. D. O'Hern (E. J. & E.) described the ideal section car as one capable of handling 10 men, with a free-running engine, one loose wheel, capable of removal from the track by three men, and strong enough to haul 15 ties or one rail. It is essential, he said, that the motor cars used by section gangs should be of sufficient strength to handle considerable material because this is of particular convenience in handling emergency work.

Considerable discussion centered around the question of the necessary protection required for the operation of motor cars, and the general impression seemed to be that all that is necessary under ordinary circumstances is for the foreman to get a line up before proceeding with his car, being careful to flag his car both ways whenever it is loaded in such a way that it is not readily removed from track. C. H. Ordas (C. M. & St. P.) said that this same practice applies on the Chicago, Milwaukee & St. Paul in the handling of motor cars equipped with mowers or discs.

"No-Accident" Officers Awarded Safety Certificates

SAFETY certificates carrying the signatures of the chief engineer and the chairman of the General Safety Committee have been prepared by the Atlantic Coast Line with which to reward all roadmasters and section foremen who have been successful in establishing no-accident records for stated periods in their work. These certificates were used for the first time in a six months' accident prevention contest among all

SAFETY

ATLANTIC COAST LINE RAILROAD COMPANY
DEPARTMENT OF SAFETY

SAFETY

Maintenance of Way Employees Accident Prevention Contest.

This is to Certify that the employees in territory under supervision of _____ Roadmaster, have attained **100%** in SAFETY, during period _____

SAFETY _____ _____ SAFETY

The 100 Per Cent Certificate Given Roadmasters

maintenance of way foremen which ended on December 31, 1924. In this contest, of 665 foremen eligible to participate in the contest, 604, or 91 per cent of the total, won certificates for not having had a man injured to the extent that required his losing more than three days from work. Of the 41 roadmasters involved 9, or 22 per cent of the

total, also won certificates for no-accident records on their districts. The total number of injuries was 34 per cent less than in the corresponding period of 1923, although the roadway forces had been increased 13 per cent. The number of men injured per 100 on duty also showed a decrease from 4.1 in 1923 to 2.4 in 1924, this reduction in personal injuries for the roadway department being greater than that in the other departments combined.

The certificates are known as 100 per cent certificates. Those won by roadmasters are 10 in. wide and certify that the employees in the territory under the supervision of the particular roadmaster, whose name is written on the certificate, have attained 100 per cent of safety during the stated period. The certificates for section foremen consist of a card resembling an annual pass, which carries the statement that the certificate is awarded to the particular foreman "For conscientious recognition of his personal responsibility for the safety of his men," printed in bold face on the card are the words, "No employees injured."

Renewing A Turntable In Five Hours

By Edward W. Towne

AN OLD 92-ft. turntable at the Great Northern roundhouse at Havre, Mont., was recently replaced by a new 100-ft. through truss in a little more than five hours. The new table was made necessary on account of the receipt a few months previous of a number of large Santa Fe type, oil burning locomotives for use on the "High Line" of the Montana division, between Havre and Cut Bank, the old table being too short to provide proper turning facilities for the heavier power.

The old structure was built in 1906 with a length of 80 ft., and was lengthened in 1912 to 92 ft. It had proved entirely adequate for the power in use up to the time that the new Santa Fe type locomotives were received, but after these were placed in service, newer and better facilities were required. The roundhouse at Havre has 41 stalls and forms almost a complete circle, with the exception of the space allotted to three entrance leads.

Considerable preliminary work was necessary before the replacement could be made. This included the building of a new circle wall of large diameter and in order to do this without interfering with the operation of the smaller table, the old circle wall was removed in sections, the radial tracks were placed on falsework and sections of the new wall were constructed. This work was handled so as not to obstruct more than five stall tracks at a time. In this manner the work progressed until the entire new circle wall was completed and the old one removed and creosoted ties placed for the new circle track.

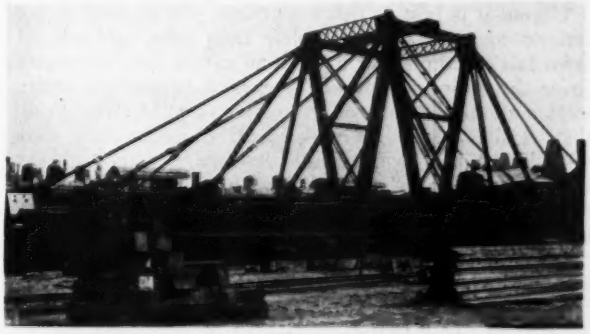
After the Old Table Had Been Removed the Derrick Car Placed the Cap Stone and Center

Another preliminary step was the reinforcement of the center pier to carry the weight of the new, heavier turntable. It was necessary to sink a test pit alongside the pier, which extended down to a depth of about eight feet below the surface of the ground, to determine the exact number of piles upon which it rested. As there were found to be 25 piles, a number considered sufficient to support the larger table, no additional piles were driven but a band of reinforced concrete was placed around the pier to increase its strength and size. As the sandstone cap stones supporting the center of the old table are too small for the new one, it was necessary to precast a new cap stone sufficiently in advance of the installation. Sixty days was allowed to permit the concrete to set or age properly.

The Center and Cap Stone in Place on the Pier

The steel for the new table was received from the American Bridge Company, Pittsburgh, Pa., and was assembled and erected by the bridge and building forces of the division at a location convenient to the site. A new 20 hp. electric tractor with its housing, was received from the Minneapolis Steel & Machinery Company.

The work of changing the tables began at 7:30 a. m. Two derricks were used in the operation, one being taken across the old table by a switch engine and placed on one of the stall tracks. The second derrick then closed in



The New Table Was Erected on Wheels.

at the opposite end and the old table was lifted from its foundation and held clear while a trestle was built and a track laid across the pit. This completed, the table was lowered onto wheels and towed out of the roundhouse circle. It was then necessary to remove the steel casting and the two sandstone cap stones and to chop off about six inches of the surface of the old concrete base or center pier to make way for the new precast cap stone and the larger center which were placed accurately upon the pier. All the radial tracks had to be shortened, but with the use of an acetylene torch this occupied but a short time. In the process, the tracks serving 41 stalls and the 3 entrance lead tracks, made up of 70 rails and 9 frogs, were shortened without delay.

After the placing of the new cap stone and center casting, the new table was towed in, raised by the derricks, the trestle and track removed and the table lowered into position on the center. The time consumed in the replacement of the turntable was a little more than five hours. Cutting down the pier was the slowest work.

How to Inspect Ties For Renewal*

By John Turman
Roadmaster, Kansas City Southern, Hume, Mo.

WE ALL KNOW that in the proper use of ties lies the main strength and life of our track. There are many things to consider; just when and how to renew the ties, and how to get the full life out of the ties means money to our railroad.

I have just started to inspect and identify the ties that we expect to renew next year. The section foreman, my clerk, and myself comprise the party making the inspection. The section foreman is provided with paint and a small brush and does the spotting. I carry a small pointed bar, to dig into the ties that cannot be easily identified, while the clerk keeps the count and marks down all ties that are to be renewed. The count is kept by the number to be renewed between each telegraph pole, and is also separated as to miles and sections. I walk in the center of the track, in order to look at the ties at both ends and the center. The foreman walks on the west or line side, to do the spotting. This I think gives us a very good chance to see all the ties and give them a thorough inspection. The ties are identified by the painted spots, so that when renewals start in the spring no mistakes will be made by the foreman on account of not knowing just what ties are to come out.

Roadmaster Should Make Inspection

I think it is well for the roadmaster to make the inspection, for it relieves the foreman to some extent of criticism for removing ties that should give more service. While making the inspecton great care should be taken to distribute the new ties through the panel of track as much as possible, in order to protect the gage, for we find a great many ties which while they carry weight satisfactorily do not hold the spikes.

There are stretches of track on the first district where there are not many treated ties. These spots should be watched closely, and the treated ties so inserted as to avoid "bunching" them.

I think it is best to delay renewals just as long as we can, or to make them complete each year, and not let them fall off in number to such an extent that we cannot cover the entire section each year. I believe the entire section should be covered every year, and in order to do that, while inspecting and identifying the ties care should be taken to distribute the new ties through the whole panel, and "go 50-50" with ties to be renewed this year and the next, so that there will not be so many to come out at one time.

I believe also that we should maintain a good standard in our tie condition. It is a bad practice to throw away ties that will give any service, and it is a still worse practice, in my opinion, and more expensive, to let tie renewals drop behind and get to a point where the section gang cannot cover the entire section each year. The result will be bad track, and an extra heavy force will be required to get it back in good condition.

Better Tie Conditions in Certain Places

Squeezes and soft, churning spots should be kept well tied. By that I mean, if you pass up any doubtful ties, let them be in some place that is dry, and not in a mud hole. A sag or a piece of fast track should get a little the best of it when ties are being inspected, for on the hills the slow track may be dry and well drained, and we can get a little more out of ties than down in the soft spots where the track is disturbed often.

I think the roadmaster is, and should be, the principal one to make these inspections. I also think the time for inspections is in early spring, say 30 days before the tie renewals start, which should be as early as the weather will permit in the spring. When the tie renewals are once started, they should be rushed to completion.

The marks that are to identify the ties should be placed on the rails. The tie ends are sometimes broken off, or covered up with ballast, or with oil wasted from leaky engine tanks.

The reason I favor making the inspection in the spring, is that it gives the inspector an advantage of 5 to 12 months to know how to identify the bad ties, for it is quite a gamble to inspect ties properly where they have two winters and a summer to go through. When making the inspection for 1925 renewals in the early fall of 1924, the inspector must or should consider the condition the ties will be in by 1926, for if the present plans are followed—and I think they should be—the foreman will follow up the check of the inspector absolutely, and except where they are burned out, or are damaged in an accident, no ties will be removed that are not marked, or spotted.

Great care should be taken in inspecting and identifying ties for renewals on passing tracks, and other back tracks. Passing tracks should be kept to within 70 or 80 per cent of the condition of the main line. I have noticed that some of my passing tracks are tied to a better standard than some railroads tie their main lines. The cause for this was, that some of them were allowed to rot and get so far below a good standard that when we did get them we inserted too many ties in one season, or at one time.

Another thing that will cause bad ties on back tracks, is insufficient ballast and poor drainage. It is time well spent to look after the surface and drainage as well as

*Abstracted from a paper presented before the Kansas City Southern Maintenance of Way Association at Sulphur Springs, Ark, on November 15, 1924.

possible. We should maintain back tracks with less ties, and keep up the standard. It should not require as many or as solid ties on back tracks as we have in some places. If we watch them closer, and make a few renewals each year, as we do on the main line, keeping the good ties distributed through the panel in a manner to protect the gage, it is much better. I notice that some foremen when making tie renewals on back tracks do not adze ties and set the rail up as it should be, which I think is a very bad practice.

A few foremen use the adze entirely too much. A tie which is chopped too much is gone and cannot give as much service as before it was cut. I believe it is much better to turn a tie over, if possible, rather than to chop into it. The adze has cost us a great deal in the life of switch ties; it is poor practice to adze switch ties any more than absolutely necessary.

Proper Attention to Tie Plugs

Another bad practice is the failure to drive tie plugs after pulling spikes to gage track on any kind of ties. Tie plugs should be driven home, not just placed in the spike hole and broken off an inch or so into the tie. It is time well spent and money saved to drive the plugs well into the ties, and dress the tops with the adze, cutting the tie as little as possible.

I believe that careful attention should be paid to the distribution of ties, and if the count is kept between telegraph poles, the ties may be distributed where they are to be placed in the track. Great care should also be taken in piling ties, to avoid piling them in borrow pits where water will stand around them, and start decay. Ties should be cribbed on as dry a spot as is possible to place them.

Ties that have been damaged before being placed in the track, are hard to identify when making inspections, as the inspector will look at the dating nail, and wonder why the tie is gone. These dating nails are a great help in identifying ties for renewals. Some one might say, "Oh, well, when a tie is broken, rotten or crushed, that is sufficient evidence that it ought to come out," and it should come out, but if a tie looks bad, and the inspector sees by the dating nail that it has given only two or three years' service, he will look it over again, and often find that it is a much better tie than it first appeared to be. In many instances the dating nails will cause the inspector to dig into the ties and give them a much closer inspection than he otherwise would, and he will find that many ties which at first glance appeared worthless, will give two or three years more of service.

Examine Treated Ties Thoroughly and Do Not Remove Them if They Can Be Carried Over

I find many treated ties which, just to give them the "once over," apparently should be removed. Look these ties over well, and if there are good gage ties on both sides they will carry good weight. I find that very few treated ties are decayed, and these few I think were bad ties before they were treated. Most treated ties require renewal because they were not properly taken care of while in use, plates were not applied when the ties were inserted, thus allowing them to become badly rail cut and later adzing them to apply the plates.

At other times I find treated ties crushed where they have been inserted between weak ties that were not carrying their part of the load, thus throwing all or too much of the load on the new tie. If treated ties are given a chance they will give much longer service; in fact, any tie will give much longer life if it is taken care of properly, and carries only its proportion of the weight, or the weight it should carry as one member in the panel.

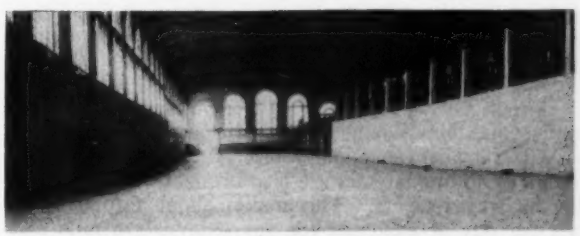
Santa Fe Makes Further Reduction in Tie Renewals

THAT the Atchison, Topeka & Santa Fe is obtaining progressively increasing returns from its consistent adherence to a program of tie preservation is demonstrated in the latest statistics of tie renewals on that system. Thus in the table below it will be seen that the renewals for 1924 average 115 per mile of track, a figure that is lower than that for any previous year.

Record of Tie Renewals on the Atchison, Topeka & Santa Fe System

Years.	Total Miles.	Total Ties Inserted for Renewals.	Total Ties Inserted Per Mile of Track.	Average Number of Ties Inserted Per Mile of Track for Five Year Period.
1898	8,185	2,751,849	336	.....
1899	9,028	2,246,250	249	.....
1900	8,804	1,687,537	192	229
1901	9,368	1,557,880	166	210
1902	9,557	1,954,823	204	215
1903	9,768	2,352,502	241	228
1904	10,237	2,770,306	271	234
1905	10,885	2,788,378	256	251
1906	11,637	2,291,997	197	263
1907	11,694	3,364,921	288	267
1908	12,169	3,666,798	301	272
1909	12,601	3,690,633	293	286
1910	13,379	3,758,984	281	273
1911	13,889	3,738,854	269	251
1912	14,488	3,192,585	220	228
1913	14,766	2,850,823	193	213
1914	15,293	2,728,629	178	200
1915	15,409	3,191,823	207	187
1916	15,517	3,118,941	201	180
1917	15,661	2,483,651	158	173
1918	15,931	2,456,203	154	164
1919	16,087	2,302,952	143	153
1920	16,899	2,753,673	163	153
1921	16,912	2,514,325	149	148
1922	17,005	2,693,905	158	142
1923	17,346	2,229,201	128	.....
1924	17,709	2,046,054	115	.....

However, the cumulative effect of good practice in the preservation and protection of the ties is demonstrated even more emphatically in the column of five-year averages at the right side of the table. The figures in this column are obtained by averaging the average renewals for each year with the average renewals for the two years previous and the two years following, a scheme which eliminates the effect of minor variations in renewals from year to year and, therefore, brings out the general trend of the renewals more clearly. In this column, it is seen that from 1909 to 1922 (the latest year for which the five-year average may be calculated) there has been a steady decrease in the average annual tie replacements from 286 to 142, or a reduction of over 50 per cent.



Concourse of the Atlantic Coast Line Station at Wilmington, N. C.

Canadian Pacific Ballasts Track at Rate of a Mile a Day

Work Is Performed Under Traffic, Using Separate Gangs of Men for Each Individual Operation

DURING recent years the Canadian Pacific has been carrying forward under traffic a program of ballasting its main lines with rock in which it has averaged from 1 to 1¼ miles of finished track per working day. Old sand and gravel ballast is being replaced with rock, working to a standard of a minimum of 9 in. of rock below the bottom of the ties. The ballasting is prosecuted by steps in which individual and well-separated gangs are employed for each of the various tasks. All of the work in addition to the furnishing of the rock is done under contract.

The reballasting of main line tracks with rock where such was not already in use was started by the Canadian Pacific in 1916, utilizing the borings from the Mt. Royal tunnel. The program now in effect, however, was not definitely arranged for until 1921, when work was begun on the line between Montreal and Toronto, 50 miles of double track being ballasted that year and 56 miles in the succeeding year. In 1923, 150 miles of single track was ballasted. The re-ballasting of this line was finished early in 1924 and work was extended to the line from Montreal to Ottawa. It is the details of this work which form the basis for the information which is given here. The rock used is a hard limestone occasionally verging on traprock and was obtained from a quarry near Smith Falls, Ont., operated by the Grenville Crushed Rock Company. This company is also the contractor for the ballasting.

All tie renewals are made well in advance of the work of skeletonizing or stripping the track, in preference to making them when the track is stripped. While it would be easier to renew ties in a stripped track it has been found that the disturbance of the track at this time often causes it to kick out or kink during the summer. This trouble has been practically eliminated by completing the tie renewals in advance.

The skeletonizing gang consists of three foremen and about 65 men who loosen up the old ballast, forking and shoveling it out from between the ties onto the ballast shoulders. This gang is kept well ahead of the rest of the work and sufficient track is cleaned out in this manner to permit of the unloading of new rock on any following day on which it may rain and thus prevent the gang from working. The old ballast is shouldered out for a distance of about 5 ft. by means of a spreader, the wings of which have been shortened by taking them off at the joint. The same spreader is also used in the distribution of the new rock, being equipped with ballast plows for this work.

Rock Is Unloaded at the Rate of a Car a Minute

Where the haul is long the rock is started from the quarry during the night at the rate of about 65 cars daily. The rock trains are operated on a definite schedule which is varied as the haul changes and to meet the traffic conditions which exist. This consists largely of passenger trains on a line where the sidings are short. About 10 additional cars are also brought out during the day by way freights. This makes about a total of 75 cars per day or sufficient for approximately a mile to a mile and one-quarter of finished track. The center dump cars which are used are equipped with safety chains, permitting a 10-in. opening. This gives an ample flow of ballast and eliminates the necessity of any particular attention to the dumping. When traffic does not permit handling a full train about 20 cars are brought out at a time with the spreader equipped with ballast plows cut in between the engine and the train. In distributing the ballast the locomotive backs up, pushing the train before it, and the cars are dumped consecutively, beginning from the far end. This is exactly opposite the usual practice and is done to prevent the pulling of draw bars. The ballast is plowed to a depth of 3 in. below the top of rail as it is unloaded. About 35 cars are used per mile of track for the first lift, approximately two-thirds being unloaded on the skeletonized track and the remainder for doubling over prior to the first lift. About the same number of cars are unloaded for the second lift which in this case furnishes sufficient rock for about 1½ miles of track. One foreman and four men are assigned to the unloading work and the cars are unloaded at the rate of about a car per minute. In order to coordinate this work properly and to see that the interference to traffic is kept to a minimum or obviated entirely, the ballast train is in the direct charge of a trainmaster at all times.

Gangs Are Spaced Well Apart

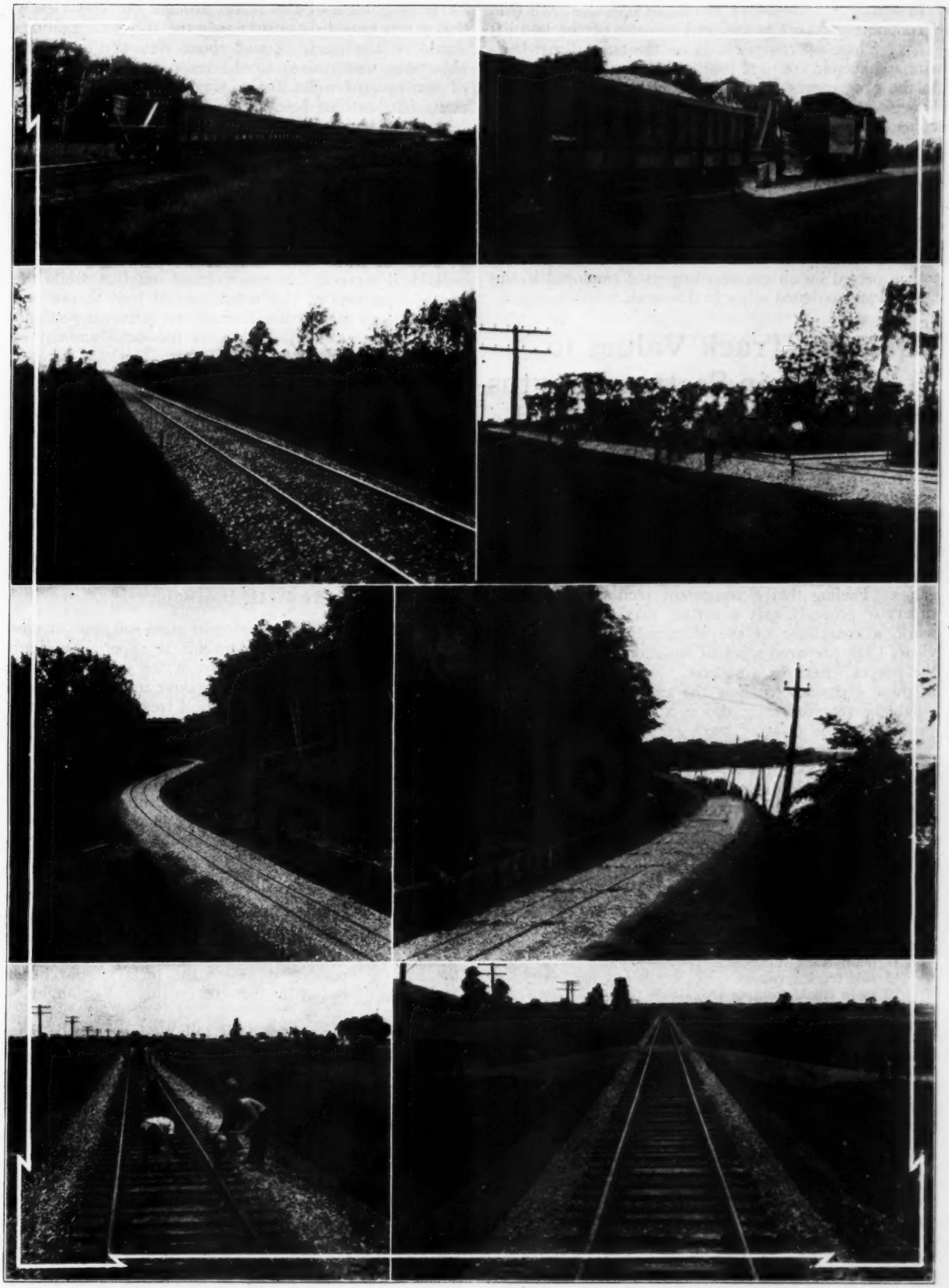
The entire work of re-ballasting is carried forward by separate gangs spaced at various distances. The first lift gang follows the unloading of the new rock and approximately two miles behind this work. This gang gives the track a preliminary lift of six inches, keeping it in fair line and surface but doing no finishing work of any nature. The second lift gang follows the first with an interval of about four miles. This is done in order to allow the track to settle well before giving it the final lift of another six inches. This gang is about 50 per cent larger than the first lift gang and in addition to lifting the track, leaves it fully tamped and roughly dressed.

The finishing-up work on the track follows the second lift gang at an interval of about three days, or approximately three miles, in order to give sufficient time for the track to settle under traffic. The lining, surfacing and trimming gangs follow in the order named and put the track in final shape. In trimming the rock is shouldered and brought up to a height of about two inches below the top of the tie. The unloading of material for and the construction of road crossings and farm crossings is handled by a separate gang of two foremen and 20 men. The entire working force is spread over a track distance of about 13 miles.

The Organization and Forces Employed

The general organization of the ballast work and the average forces employed are as follows:

Work	No. of men	Foremen
Stripping the track	65	3
Unloading rock	4	1
First lift	42	3
Second lift	65	3
Lining gang	11	1
Surfacing	18	2
Trimming	28	2
Crossings	20	2



Unloading the Ballast.
Ready to Start Raising.
Stone Unloaded for the Second Lift.
Final Lining and Surfacing.

Plowing Stone from Between the Rails.
Giving the Track the First Lift.
Making the Second Lift.
The Finished Track.

In addition to the above forces, an operator with field telephone equipment is assigned to each of the two lift gangs. These operators cut in on the train dispatcher's wire and keep in constant touch with him during the day. As the gang moves forward, the telephone equipment is likewise moved ahead so that the operator always remains within easy hailing distance of the gang. This local operator is kept posted on all train movements, etc., and through this information, the gangs are enabled to tamp in the necessary runoffs with a minimum loss in idle gang time and without delaying traffic. All ballasting, etc., is, of course, done under flag protection also. The entire work is done under the direction of a superintendent employed by the contractor and is supervised and inspected by an engineer-inspector employed by the railroad and assigned solely to this work.

Equating Track Values to Obtain Section Lengths

ON MANY roads, the section lengths have been made practically the same for the same general class of territory and track. In such cases this has resulted in each section foreman having the same length of line to supervise and care for, more or less irrespective of the varying conditions existing on the different sections. These variations are usually compensated for to some degree by the assignment of a greater or lesser number of men and by the use of extra gangs. Feeling that a competent section foreman can supervise properly only a certain maximum amount of work, a committee of the Metropolitan Track Supervisors Club prepared a set of equations for determining the proper length of a section. No attempt was made in these equations to show the amount of labor which would be required since this is a variable quantity, depending on the class of track construction, traffic, etc. The unit of measure which was taken for determining the equivalent value of all the important physical properties of a track was one mile of main line track (steam). The values for the different units, equivalent to one mile of track are as follows:

0.8 miles electrified main track, 3rd rail.
0.9 miles electrified main track, overhead.
2.0 miles passing sidings.
3.0 miles yard tracks.
1.25 miles tracks on elevated structures, trestles, etc.
0.5 miles steam tunnel.
0.75 miles electrified tunnel.
12 main track turnouts.
15 side track turnouts.
10 main track crossing frogs.
15 side track crossing frogs.
5 main track slips.
7 side track slips.
8 heavy traffic street crossings.
14 medium traffic street crossings.
20 light traffic street crossings.
30 farm or country road crossings.
25 acres of right of way, outside of ditch line.
200 insulated joints.
1,500 feet of track pans.

The recommendations for the length of single, double, four and six-track main line sections in equated miles of track were as follows:

Single-track sections should not exceed 6 equated miles of track.

Double-track sections should not exceed 8 equated miles of track.

Four-track sections should not exceed 8 equated miles of track.

Six-track sections should not exceed 8 equated miles of track.

The discussion of this report brought out very clearly that it was intended to cover only the average conditions found on the roads in and about New York. Some objections were raised to the recommended maximum of six equated miles for a single track section since many felt that one foreman could properly supervise as high as 10 miles of line provided there were no complicating physical characteristics. It was suggested by some that these equations should be applied to a supervisors' sub-division, thus determining the approximate number of sections which the sub-division should be divided into. A further study in which local conditions would be taken into consideration would then have to be made in order to determine the exact lengths for the individual sections. It was pointed out that while the use of equations of this nature would tend to even up the duties of the section foremen on different sections, it did not necessarily imply that the same amount of labor would be needed in each case. This was because of the fact that the amount of labor necessary to maintain different sections would vary according to the weight of rail, the kind of ballast, the amount of traffic and other factors which had no major effect on the amount of territory which a section foreman could successfully supervise.

The Reason for Battered Rail Ends

By P. H. Hamilton

WITH the heavier and more rigid rail sections now being used, more trouble is experienced with battered rail ends than in the past, indicating that as the wheel loads become heavier and the rails more rigid, the impact between the wheel treads and the heads of the rails becomes greater. Most trackmen seem to be of the opinion that the rails now furnished are not as tough as when lighter sections were used. There is no doubt that rails of harder steel will not flow as much and will not batter as fast; but I have recently noticed manganese rails which were chipped at the ends, apparently from jamming. It is not yet apparent what will develop from these chipped manganese rails.

Battered rail ends result in broken rail joints, loose bolts, shattered and cut joint ties and damage to engines and cars. They cause endless work raising and tamping these joints and even with continual attention make poor riding track. They start from soft rails (which result in the natural breaking down of the metal), split heads and chipped heads (due to metal flowing and jamming of the rail ends).

In the case of soft or split rails nothing can be done except to remove the rails. However, it is possible to prevent a large percent of the chipped rail heads if the trackmen will exert the proper diligence for a short period after the new rails are laid, or until the "cold rolling" under traffic has subsided. After a rail becomes chipped at the end, continual pounding under traffic results in a battered rail. The effect and the results are cumulative. In extreme cases the battered rail should be removed long before its average life is attained. With the heavy or stiff sections, the cold rolling of the upper section of the head starts immediately after the rail is placed in track. After a short time the continuous rolling under traffic causes the top surface of the rail to become tough, but during this interval it tends to flow and spread out, not only sidewise but lengthwise. When this happens to be at a joint where there is an opening between the rail ends the top surface of the head will flow endwise

and frequently the two fins on the adjoining rails will touch. Later, if these two rail ends jam together, these fins which have flowed over will chip off and a battered rail end starts. If the rail ends are close enough together, the small elongation or fin on one rail will lap over on the adjoining rail. After a short time this fin may break out and start a battered rail end.

It is possible to prevent a great many battered rails by adopting the following precautions. (1) Rail should be laid with the expansion allowance in joints as nearly correct as possible. (2) Rails should be anchored with rail anchors immediately before trains pass over. Particular care should be taken to see that all rail anti-creepers bear tightly against the cross ties. Anchoring both ways would be effective. No matter how much the track creeps in one direction, it back up at times due to contraction in the rails and this plays havoc with the expansion allowances. (3) The rails that are liable to chip should be anticipated and the fins that have flowed over the ends should be burned off with an acetylene torch or removed by some other method before they have a chance to break off. This is not an endless job for a proper tool can be designed to square up the ends of rails in track before they get to the point where they will chip. The top of the rails becomes hard after they are in track for a time and the flow of the metal will then be greatly diminished if not stopped altogether.

Skillful Use of Dynamite Simplifies Pier Removal

AN EFFECTIVE blasting operation was carried out some time ago in the removal of a swing bridge pivot pier in an arm of San Francisco bay which is worthy of detailed description because it serves as an illuminating illustration of the value of explosives in wrecking operations of this kind if the work is carried out under the supervision of men experienced and skilled in this special branch of engineering. The bridge in question was built 27 years ago by the Southern Pacific across Oakland inner harbor at Harrison Street and carried suburban trains between Alameda and Oakland as well as a limited amount of switching movements to adjacent industries.

The bridge consisted of a steel swing span 335 ft. long turning on a concrete pier of the cylinder type 25 ft. in diameter and 44 ft. high. This was supported on 74 piles driven into the bed of the estuary. The bottoms of the piles were 70 ft. 6 in. below the base of rail level on the bridge and their tops were cut off at various elevations so that the lengths of the piles ranged from 25 to 44 ft. For the purpose of constructing the pier the piles were surrounded by a steel caisson having a diameter equal to that of the finished pier and a height of 44 ft. 3 in., concrete to a total of 818 cu. yd. being placed inside of this caisson.

War Department Ordered Removal of Bridge to Improve Shipping

Some years ago the United States War Department ordered the removal of the bridge and piers as they interfered with the free movement of ocean-going ships in the harbor. Removal was delayed during the war and finally the span was removed on December 26, 1923, following which the work of removing the piers was undertaken.

The landing piers were of creosoted piles and were dredged out. The War Department required the entire removal of the pivot pier, and the removal of the piles supporting it to a depth of 40 ft. below low water. It became necessary, therefore, to break up the concrete so that it could be handled by a dipper dredge. One difficulty that presented itself was the fact that vessels drawing 25 ft. of water might pass close to the site of the pier immediately after the shot and would be damaged if large pieces of concrete should be thrown into the channel.

After a detailed study of the situation the following plan was adopted and carried out. A suitable platform was provided to support a drilling outfit and work was started in the drilling of a hole 7⅝ in. in diameter by 41 ft. deep in the exact center of the pier, leaving 4 ft. of concrete at the bottom. In filling in that part of the pier above the piling, large pieces of solid granite rubble were imbedded in the concrete. Drilling the concrete was made more difficult when this granite as well as the wooden piling, and even pieces of steel, were encountered on the way down.

Spring Hole to Take Large Charge

The bottom of the bore hole was sprung nine times. This made a chamber somewhat over three and a half feet in diameter and into this 475 lb. of 100 per cent blasting gelatin was packed. In this chamber with the blasting gelatin were imbedded three waterproof electric blasting caps connected in series, each electric blasting cap being connected to a separate line of double countered cordeau extending up through the bore hole. This was taken as a safety precaution to insure the detonation of the charge.

The remainder of the bore hole was filled alternately with clay tamping and explosives in 14 separate charges. The first eight charges above the 475 lb. of 100 per cent blasting gelatin consisted of 80 per cent gelatin dynamite, the next four charges consisted of 55 lb. each of 60 per cent gelatin dynamite and the top charge consisted of 32 lb. of 40 per cent gelatin dynamite and 25 lb. of 100 per cent blasting gelatin. All these charges were separated by damp clay tamping, packed tightly. The three lines of cordeau passing up through the bore hole penetrated each of the charges, and thus detonated them all practically simultaneously, but as the heavy charge in the chamber was detonated first and was a very much quicker explosive than the gelatin dynamite in the bore hole it was possible to dig a hole in the mud to receive the broken debris when it fell back.

Amount of Explosive Per Yard of Concrete

The total quantity of explosives used in the blast was 1,232 lb., not including the charges used for springing the chamber. This is equivalent to 1.51 lb. of explosives per cubic yard of concrete broken up or 1.38 tons of concrete broken per pound of explosive used.

When everything was ready for the blast the drilling outfit was removed, the estuary was cleared of boats for a safe distance and the draw on the bridge 300 ft. to the west was closed. The electric blasting cap wires were connected by leading wire to a blasting machine located 300 ft. distant after which the blast fired at extreme high tide.

Immediately after the shot, soundings were taken around the side of the pier and as no large pieces of concrete could be found navigation was allowed to proceed. The concrete and the steel casing was then dredged out and the tops of the piles were broken off at the required depth. The dredge worked over a sufficiently large area to make sure that all pieces of the old pier were removed. The work was carried on according to directions offered by J. C. Costello, explosives expert, Giant Powder Company, San Francisco, Cal.

Consider the Quality as Well as the Quantity of Work Done

Measures Designed to Obtain Increased Performance Should Be Applied With Caution

By J. D. Keiley

Supervisor, Maintenance of Way Department, Chesapeake & Ohio, Russell, Ky.

FROM among the thousands of small shops manufacturing the world's needs there has been evolved the great manufacturing consolidations of today. The personality of the owner, or master craftsman, no longer infuses the organization. Rule of thumb methods have succumbed to scientific research. Every influence which goes to control or make for economy in manufacturing on large scale bases is closely and constantly studied.

Manufacturing or production is obtained by the planning and the co-ordinate efficient utilization of material, equipment and labor. The efficiency of production upon which the life and existence of any manufacturing unit must ultimately stand is dependent upon the proper manipulation of these three units.

There are two controlling factors, quality and quantity. Upon these two factors depends the success or survival of any manufacturing enterprise in the highly developed economic structure of today. Quality and quantity are intricately interwoven. Upon the nicety, balance and absolute control of these two factors depends the efficiency of production of any manufacturing unit.

Maintenance of way work is a manufacturing proposition and like all manufacturing problems deals also with materials, equipment and labor.

Like other units of manufacturing, maintenance of way work has the inherent and universal characteristics which apply to all manufacturing enterprises, namely, quality and quantity. Comparisons have been made previously and the section gang of today has been likened to the small shops of the past. These shops were under the close supervision of the master craftsman. His personality, so to speak, infused the organization. The character of the work turned out, or the quality, as well as the quantity, with their relative proportions was directly dependent upon the master craftsman. If he survived he was, by necessity, peculiarly or intuitionally fitted for the work. Owing to the smallness of his shop it was needless and far too costly to make exhaustive studies of his methods. Therefore, most of his knowledge was intuitive or gained through practical experience. The typical section gangs of today are similar to those small shops of the past.

Small Shop Has Been Eliminated

Progress has eliminated the small shop of the past, each turning out a like product and each controlled by a master craftsman. In their places have arisen the great factories of today. Here complicated machinery does a great proportion of the work. The division of the labor is very intricate and detailed. Studies of methods for the control of quality and quantity in general factory production have become standardized. Lessons of tremendous practical value can be learned and applied to maintenance of way work by studies similar in character to those made for increasing factory production.

Maintenance of way work cannot be consolidated under one roof. It will always be necessary to have widely deployed forces performing the work. Since consolidation under one roof is impossible track work for some time to come will be performed by comparatively small, widely scattered gangs.

It would, therefore, be impractical to inject into maintenance work all well established factory procedures. But with proper modification and application of a number of these methods amazing results can undoubtedly be obtained by these small gangs or units of maintenance production.

Track work may be considered as mass production. It is neither intricate or complicated. This is possibly the reason it has not received the intensive study it deserves. Economy in maintenance can only be obtained when the management and men know what they are shooting at.

Only Quantity Production Has Been Studied

The division of labor, or the standardization of methods of performing maintenance work has received some study but this seems to have approached only one side of the problem. The pertinent object in each study seems to have been that of getting more work per man hour of time. No definite mention or attempts to control or study quality have been made. For example, the analyses are concerned with so many ties applied per man hour with an allowance for traffic delays, etc., so many miles of rail laid per so many man hours, etc. Accompanying these is usually a short description of the methods and organization of the gang employed in the accomplishment. Indeed the importance and value of information and studies of this character cannot be over estimated, but a factor of equal importance, that of quality of the work performed, has apparently been neglected.

The basis upon which goods are purchased is quality. Quality is the characteristic which distinguishes the grades of the same goods as to life, wearing qualities, hardness and various other attributes of either intrinsic or aesthetic value. The combination of elements upon which quality is generally based are materials, workmanship, finish, design and size.

Considering each of the above in turn we find that to obtain a required quality it is necessary to maintain uniformity in the raw materials which enter therein, to obtain a uniformity in the manner in which the raw material is assembled with strict adherence to specifications, and to secure uniform finish, either for appearance, or to produce given results when used in connection with further production. In many if not all cases quality is dependent upon the strict adherence to a given design and specifications. The importance of the strict adherence to size depends on the material

or product and the purpose for which it is used. It is at this point that tolerances of size must be considered.

The quality of steel can be and is measured by its chemical and physical characteristics. The life and service of ties, treated or untreated, under varying conditions of traffic, has been estimated or measured. Quality of ballast is measured according to arbitrary standards as to size, shape, hardness, etc.

The Influence of Labor

A question of passing interest might be to consider the effect of the study of quality production work on the men in the field. Where a drive is made with the sole object in view to increase production per man hour, or the quantity of the work performed there arises the age old question of bargaining. Labor immediately gets the impression that the company is trying to get more for its money than it is willing to pay. By taking into consideration not alone the quantity per man hour, but also the very vital point of quality, a point of mutual contact and interest may be reached. No mechanic, foreman, or workman worth the name objects to the quality of his work being improved. Instead of driving on quantity alone, if quality is taken into consideration eventually quantity will increase.

The age old saying, "haste makes waste," still holds. If the haste is not well directed an increase in the quantity of work per man hour does not effect a real money saving. Due attention must be given to quality. There is a general delusion that the attainment of quality is an expensive, costly and difficult phase of production. Quality is not relatively costly. It is seldom if ever cheaper to sacrifice quality in favor of quantity.

To control something, every detail of that something must be known in minute detail. In order to accomplish a given thing instructions must be issued. Instructions in maintenance of way work, for the performing of work, take the form of specifications or standards. Every effort must be made to secure the realization of the standard set. The effort must be made consciously (not unconsciously), with full knowledge of what the results will be if the standards are not adhered to.

Progress in any industry is absolutely dependent upon the effectiveness in the control of quality. To control the quality of any material, or application of materials, it must be capable of measurement.

There are a number of elements which enter into the riding quality of track. The gage of the track is standardized, but merely keeping the rail to gage will not insure the riding quality of the track. The control and positive control of all the elements entering into the riding qualities of the track must be attained and maintained. The riding qualities of the track depend on the quality of many elements which are capable of being analyzed separately and when taken as a whole and grouped together give the final characteristic of riding quality. Standards of quality of riding can be set but it requires continuous, positive and active inspection or control, to maintain the standard set.

Quantity Should Not Be Neglected

Strict adherence to a uniform standard of quality does not mean that quantity production should be neglected. A practical example is to be found in the case of the extra gang foreman who wants to make a record for laying rail in terms of so many feet per man per day. In his haste he neglects to tighten the bolts properly, to get a good bearing for the base of the rail, to surface the track properly, and to look out for other minor items. While these deficiencies will not show up at once they will eventually be the cause of not getting the maximum life from the rail and result also in injury to the equipment, although this will not be directly evident. In plain words there is no control of the quality of the work performed.

There should be some impartial, mechanical means of determining the character of the work performed. Inspectors using their judgment unaided by mechanical means are not competent judges. There is also a great difference in the judgment of the most honest inspectors.

The basis of all that is scientific is measurement. The more exact the measurement becomes, the more perfect becomes that science. This is as true of railway maintenance, as in any other manufacturing. The maintenance of a fixed uniform standard of quality is a task and one which revolves into a matter of close practical measurement and inspection. The tendency to slip from the standard set is always present. There is great difficulty in making any type of product conform to an absolutely uniform standard of quality. Performing maintenance work may be with slight modification considered as a manufacturing problem. The difficulties and obstacles which are always present may explain why quality control in maintenance has not received the study it deserves.

Standards Must Be Observed

It is not enough to create standards and issue instructions that they are to be obeyed. The difficult and vitally necessary task is to see that the standards set are adhered to. In performing work either the same day; day in and day out, or once a month, it is human to slight parts of the work. As time passes the deviations from the standard usually increase. To prevent errors a close continuous check must be made and kept. With widely deployed section forces the liability to deviate from standards is great. There is only one way to check work of this character and that is by some mechanical means.

Track maintenance is not controlled and kept to a uniform and absolute standard of quality. To accomplish this would require positive and scientifically directed effort on the part of the management. Standards must be set and an organization established capable of seeing that the standards of quality are consistently adhered to with unvarying continuity.

To do this means the organization of an inspection department. Merely taking men well qualified in the performance of various types of maintenance work and making inspectors of them will not put quality standards on a solid foundation. Mechanical methods of measuring variation in quality must be developed.

Mechanical Measurement is Necessary

Accurate work cannot be done by the ordinary individual without the use of mechanical means of check. This human trait in the liability to make errors is very pronounced when comparisons are made between standards set and work produced when made without aid of mechanical devices. Take an ordinary example of track lined by the eye, and checked by the eye. Then have a transit run over the work. Errors will be found, and some surprisingly large. Another example is to be found in the foreman sighting for low joints in the track. Many a swinging joint will go unnoticed due to the spring in the rail, these all lead

to bad riding track, and in the lessened life of the various materials.

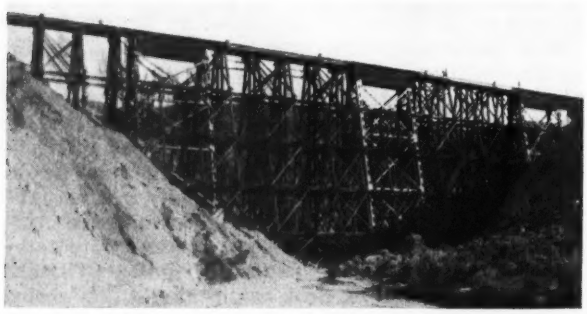
Would not a man who made measurements of a mechanically machined piston with an old wooden yard stick or possibly estimating by eye how much should be turned off in the lath for a fit be considered as to his sanity? No one would recommend using calipers on low joints but there are certain tolerances which should determine at exactly what point the joint needs tamping and what joint needs attention before all others. The greatest need in maintenance work is mechanical measuring devices. Outside of the transit and level, which are as old as the railroads, there has been comparatively no advance in measuring instruments. It is a historically known fact that advancement in any science comes only as accuracy in measurement develops.

Track extends over great stretches of distance, therefore, it is necessary to have continuous, mechanical measurement properly recorded. Irregularities, for example, of line and surface, must be transmitted to the foreman at once. These irregularities must be measurable in the units of an arbitrary scale so that they may be compared.

Thorough Plan Insures Success of Viaduct Erection

By F. H. Cramer
Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago

A WOOD frame trestle bridge 417 ft. long and 97 ft. high on the Chicago, Burlington & Quincy near Cody, Wyo., was replaced by a steel viaduct embracing two 80-ft. girder spans without any interruption to traffic last season. The structure is on the branch of the Casper division leading to the east



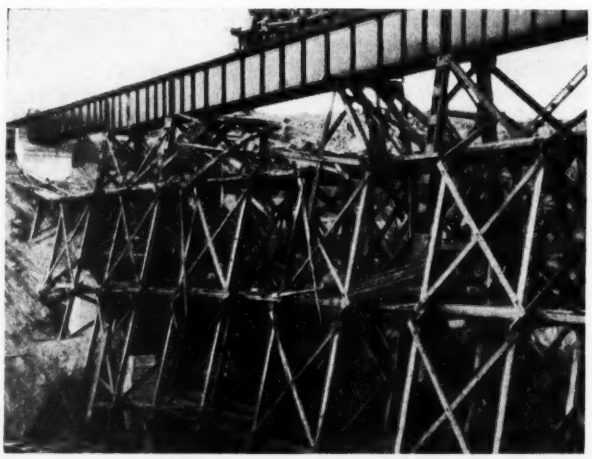
The Tower Spans Were Placed Before the Two 80-ft. Spans Were Erected

entrance to Yellowstone Park. It comprises a crossing of Idaho creek which empties into the Shoshoni river a short distance below the bridge. The original trestle was built in 1901.

The Line Is in Rough Country

The surrounding country is very hilly. The bed of the stream is a gravel and sand formation, while the slopes on each side are of hard shale and natural rock. The trestle consisted of frame bents supported on pile bents driven in the bed of the stream with thin caps, high enough to clear high water and on benches cut into the natural rock on the two slopes. A few timbers had been replaced previously because of local deterioration but practically all timber was salvaged for further use in repairs, bracing in cofferdams, blocking for falsework, etc. The material evidenced excellent carpenter work in framing the high bents. The new steel bridge will greatly reduce the maintenance and fire hazard and obviate the expense of a watchman, whose duty it was to patrol the bridge after every train passed to guard against fires.

To reduce the expense of falsework to a minimum, the design of the new deck plate girder viaduct was laid out so that each steel bent and the concrete piers, as well as the abutments at each end of the new bridge, could be erected between the old frame bents which were arranged in 16-ft. panels. To meet this requirement the viaduct was laid out with three 32-ft. tower spans, two 80-ft. intermediate spans, a 65-ft. span on the west end and a 50-ft. span on the east end, all spans comprising two deck girders spaced 7½ ft. center to center. The bridge terminates at each end in a 14-ft. concrete slab. The substructure consists of concrete pedestals, piers and abutments. Several other schemes were developed but estimates showed that this was the cheapest. The steel viaduct was designed for Cooper's E-50 loading under the American Rail-



All Steel in the New Bridge in Place. Note How the Steel Towers Cleared the Timbers of the Old Trestle

way Engineering Association specifications of 1920. The concrete was placed and steel erected by railroad forces.

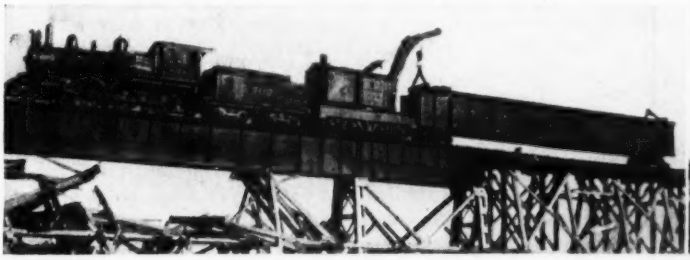
The rock on the slopes varies from sand stone to flint. Practically all of the excavation for the foundations for the concrete piers had to be blasted out and in order not to disturb or damage the wooden trestle only light shots of dynamite were used. An air compressor plant was set up so that the drilling could be done with air drills. All concrete was mixed in a

mixer set up in turn at each end of the bridge. It was placed by means of chutes to each pier and abutment.

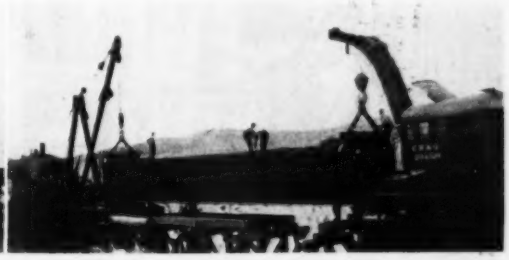
Unloading the Steel

While the concrete was curing, all of the steel was unloaded and the girders of each span were completely assembled alongside the track about 1,500 ft. east of the bridge. It was impossible to get closer to the bridge on account of the high banks on each side of the track. As soon as practicable work was started on the erection of the steel towers. The posts cleared the wooden bents entirely but the placing of the struts and sway bracing required some minor shifting of the old sway bracing and line struts. After all the towers were erected, the east 32-ft. tower span was set. This was followed by the east 50-ft. span and the center and west tower spans. This procedure was followed so that the derrick cars could be supported entirely on the new towers rather than on the old trestle when erecting the longer girder spans.

The concrete slabs at each end were not placed until all of the steel was erected because the abutments had not been entirly completed when the steel erection was started and every effort was made to rush the erection so that heavier locomotives could be used to haul the trains operated over this line when the park season opened early in June. After the last 32-ft. tower span had been placed the next step was to place the two 80-ft. spans. These were completely assembled with the creosoted ties and timber guard rails for the deck in place. Each span weighed about 60 tons.



Backing One of the 80-ft. Spans On the Trestle With One of the Cranes



The Span Was Blocked Above its Final Position While the Timber Was Being Cleared Away

The New Idaho Creek Viaduct

How the Girders Were Erected

In each case, before moving out the span the upper portion of the old trestle was prepared for expeditious removal. When ready to be moved a locomotive crane was placed at each end of the span to raise it and set it on two standard car trucks. After the span was fastened to the trucks and other fastening arrangements completed between the span and one of the cranes, the crane and the spans were backed out on the bridge by a locomotive, as shown in the photographs. When the span was moved over to its final location the second crane was attached, the derricks were blocked and sufficient space was allowed between the end of the span and one of the cranes to allow the car trucks to be moved from under the span. The span was then raised and the trucks were moved into the clear, after which the span was set on blocking supported partly by each 32-ft. tower span and by a special wooden pony bent set on the top of the steel bent.

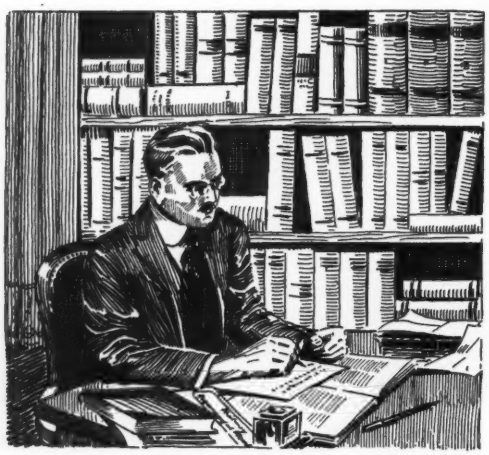
With the span in this position, men could work under it to remove the top of the old structure. The first blocking over the ties was high enough to clear the track rails on the old trestle, which were moved into the clear at each end of the span as soon as the men had pulled the spikes and loosened the angle bars. The ties on the old trestle were bunched and lowered to the ground below by the auxiliary fall line on each derrick. The old stringers, caps and top section of each bent were lowered in the same way. At no time during this operation was any slack allowed in the main lifting toggle as a precaution against accident on account of the extremely high wind which is characteristic in this section of the country a great deal of the time.

This operation cleared the old trestle except the two short bents at each end. The span was then raised and the blocking, ties and short stringers removed, after which the span was lowered and set on the pony bent. While in this position the remaining two bents were removed. The span was again raised, the pony bents removed and the span let down into final position. The second 80-ft. span and the 65-ft. span were handled in the same way. Riveting of the towers was done under traffic.

The design and construction were carried on under the direction of A. W. Newton, chief engineer of the Chicago, Burlington & Quincy. G. A. Haggander, bridge engineer and the writer. P. Kuchera, master carpenter, and T. Croskary, bridge and building foremen, were in direct charge of the work.

Concrete Arch on the Pacific Electric

What's the Answer?



This department is designed to serve as a reader's service bureau, wherein the many problems which arise in the routine maintenance of tracks, bridges, buildings and water service facilities, may be subjected to frank and thorough discussion. The value of the service thus rendered is proportionate to the extent to which readers avail themselves of it, in submitting questions and in lending their co-operation by offering answers to the questions presented.

Can You Help Us Answer These Questions?

1. Under what circumstances is it economical to incur overtime for work train crews in order to increase the output from maintenance gangs which they are serving?

2. How far is it economical for bridge and building crews to travel to and from work each day on motor cars before putting camp cars in service or shifting camps to a new location?

3. What is the proper amount of elevation per degree of curvature which should be given curves up to and including five degrees on a grade where the speed of freight trains ascending is as low as four to ten miles and descending is limited to 25 miles per hour and where passenger trains do not exceed 40 miles per hour?

4. Should a bridge stringer be placed so that the majority of knots, checks or other defects come at the bottom or top? Is it more important to turn the stick in such a position that the heart wood is at the bottom?

5. What are the qualifications of a crossing flagman? How should he be selected? What measures should be taken to insure that he is constantly on the alert? Is it practical to give him other duties?

6. Can vitrified pipe be safely used for water supply lines and if so, under what conditions and according to what methods should the work be done?

7. What is the most efficient method of removing a scant growth of weeds and grass from stone ballast?

8. Should the attics of railway buildings be provided with openings to permit the circulation of air during hot weather? If so, how should this be done?

The answers will be published in the May issue.

Saving Coal Around Water Stations

What measures can the operator of a steam, gasoline or kerosene operated pump station adopt to reduce his fuel consumption?

Adjusting the Engine May Help

Geo. H. Warren
Water Supply Foreman, Union Pacific, Hays, Kans.

Economy of fuel at railroad pumping stations is promoted first of all by using an engine that is adapted for the work it is performing. Engines do better work under load than where idling is excessive. It is impossible to regulate the fuel where widely irregular conditions exist.

Where a two cycle internal combustion engine is used for pumping the water it is essential that the engine is kept hot enough to vaporize all the fuel forced in at each injection of the fuel pumps. This is something that the operator is apt to neglect, especially where the engine is cooled by the Thermo system instead of running water of an even temperature direct from the pump and discharging it through a waste line. This type of engine should be run as near as possible at the speed which is specified by the manufacturer and usually stenciled on the engine. This will require frequent tests with a speed indicator. Where possible, exhaust pipes should be watched, as the lighter the color of the exhaust the less chance there is of combustible gases being wasted. Frequent inspection of the injection nozzles and of fuel pumps is important; as is the precaution to keep the exhaust ports free from caked carbon, as a partially closed exhaust port will reduce the engine speed, with the result that the governor will close and automatically let more fuel into the engine.

The Opportunity at Steam Plants Is Large

C. N. Barbour
Assistant Engineer, Southern Pacific, Houston, Tex.

Before the operator of any steam pumping plant can be expected to produce fuel economies, certain improvements; if not already undertaken should be made, which will in themselves reduce the fuel consumption by a large amount. These improvements are as follows:

There should be installed in the plant a suitable size open type feed water heater and two boiler feed pumps. The heater will utilize heat from the exhaust steam of all pumps for heating boiler feed water, thereby reducing the fuel consumption up to a maximum of 15 per cent.

The boiler, if metal, should be insulated as thoroughly as the boiler of a locomotive. In case of a brick-set boiler, all cracks and air leaks should be filled with plastic material.

All live steam lines should be insulated with the insulation protected by a sheet metal jacket or water proof material, if out doors.

The boilers should be equipped with suitable cottom and stack dampers, the latter to be made adjustable from the front of the boiler.

In coal burning plants, the boiler grates should be kept in good condition. If oil burning, the plant should be equipped with a suitable oil burning system, preferably two oil pumps with a governor, efficient type burner, strainer, air chamber, pressure

gage thermometer and meter. Exhaust steam from the pumps may be used to heat the oil. The furnace should be large with air admission spaces properly arranged.

The stacks should be designed with sufficient diameter and height so that wasteful steam blowers for creating artificial draft will not be necessary.

The steam used for heating and from drains from steam cylinders should be reduced to a minimum by the use of steam traps.

When these principal improvements have been made, the pumper may reasonably be expected to reduce his fuel consumption by any or all of the following means:

He should keep an accurate record of the fuel burned, together with the quantity of water or oil pumped. Without this knowledge he cannot tell whether the fuel is reduced and will have no incentive for further economies.

He should adjust the fires and dampers continuously to maintain the steam pressure with the least amount of excess air. This condition usually exists when the furnace is filled with a soft fire, producing a slight haze at the stack. The exact state of combustion may be checked with a simple and inexpensive gas analyzer.

All steam, water, air and oil lines and valves should be kept free from leaks. A small steam leak will waste over 25 cents worth of fuel per day.

All soot should be removed from heating surfaces daily. This may be accomplished fairly well by blowing the tubes or flues with a steam jet.

The boiler should be washed frequently enough to keep the water surfaces free from scale.

The pumps should be properly packed at all times.

By adopting such measures to generate, distribute and utilize steam efficiently, it has been possible to reduce the fuel consumption by as much as 50 per cent.

Stop the Leaks in Tanks and Water Lines

By R. L. Holmes

Engineer Water Service, Texas & Pacific, Dallas, Tex.

All operators can save considerable money for their company by stopping small leaks in steam, oil or water lines and they should report promptly whatever conditions they are unable to correct themselves. Another serious cause of loss around water stations is a leaky water tank, which should not be permitted.

Laying Roof Boards

Does the saving in heat justify laying roof boards tight and placing a layer of building paper between these boards and the shingles?

The Boards Should Not Be Tight

By a Railway Architect

In the days when shingles were used more extensively than now, for roofing, it was customary to lay the roof boards loosely and to omit the use of paper between these boards and the shingles. Usually boards of various widths such as are reclaimed from other structures are used for this purpose, care being taken only to use boards that will lay flat and to lay them close enough together so as to offer no obstruction to proper nailing of the shingles and to provide sufficient strength to the roof. Spaces all the way from an inch to two or more inches are left between the boards.

Such a roof is wasteful of heat. It is only necessary to observe the surface of a shingled roof on a frosty morning to recognize this, as it will invariably be noted that the portion above the roof will be steaming or completely dry long before those portions which are not exposed to the heat from the interior. This loss of heat is such that if only the question of heat were involved, not only should the boards be laid tightly, but a layer of insulation should be used between the boards and shingles. The practice of laying the boards loosely, however, is justified by reason of the ventilation which a shingle roof must have to prevent rapid deterioration. During rains shingle roofs get damp. If the boards are laid close together as is the case with prepared or composition roofs, and the shingles underlaid with paper, the shingles and nails will soon rot out.

Where it is desired to use shingles and at the same time save fuel, the solution of the problem is to provide an attic space and place insulation between the attic and the rooms below. In no case is it deemed advisable to lay the roof boards tight and use building paper between these boards and the shingles.

Switch and Switch Stand Inspections

What measures should be taken to insure thorough inspection of switches and switch stands? How would such inspection be reported?

Special Inspections Should Be made Periodically

By Maurice Coburn

Assistant Engineer, Pennsylvania, St. Louis, Mo.

Experience on the Southwestern region of the Pennsylvania has proved that a systematic inspection of frogs and switches is worth while. Such an inspection is now made twice a year, a specially prepared printed blank being used for the record. This inspection has usually been a part of the superintendent's general division inspection, in which the entire staff participates. Sometimes it is made with a motor car, one division using a motor car and trailer.

The inspection is made in the presence of the foreman, who receives a carbon copy of the report for his section and reports when the defects are corrected. All details such as the gage, guard rail clearance, fit and condition of points, condition of bolts and cotter pins, etc., in connection with the turnout are noted. The switch is thrown and tested for play and particular attention is paid to the stand and connections.

This inspection rarely finds important defects now and at times it requires some effort to keep up the interest in it on that account, but it impresses upon the supervisor and the foreman that they are to be checked up and that careless maintenance must not be tolerated in this important respect at any time.

It should be understood that this inspection does not replace daily thoroughness, but emphasizes the need of constant attention. A semi-annual inspection seems often enough for the purpose, but the division engineer and supervisor should watch the turnouts constantly, calling attention to any defects discovered.

A Weekly Report Should Be Required

By W. H. Sparks

Inspector of Track, Chesapeake & Ohio, Russell, Ky.

The report of switch inspection made to the supervisor at the end of each week is one of the most important he receives. This gives him a check on all main line switches.

The track walker should inspect all main line switches, seeing that all bolts are tight around switch points and guard rails, frogs and switch stands. He should also oil up the parts around stands and switches and frogs, so that they will work freely and should report to the foreman each day as to the condition he finds.

The foreman should be required to make a weekly inspection of all his main line switches, going over the gage and all bolts, and inspecting the condition of head rods, switch stands, guard rails and frogs. He should

also see that everything is well cleaned from around the points, frogs and switch stands.

This weekly inspection of the section foreman should be reported to the supervisor each Saturday. On the Chesapeake & Ohio the supervisor of track has to make a report at the end of each month to the division engineer and superintendent of all his main line switches inspected, and showing the condition of each switch.

The foreman should not wait for Saturday of each week to come, before inspecting his switches, but should go over his section every few days and check the track walker up. The time he is away from his force for this purpose will be time well spent.

The Method of Inspection Is Important

By T. F. Donahoe

General Supervisor, Baltimore & Ohio, Pittsburgh, Pa.

The division engineer or a competent man assigned by him should inspect all main track switches not less than once a year. In addition the supervisor should be required to make a monthly inspection of all switches, frogs and stands, recording any defects found in a note book having a sheet of carbon paper with which to make a copy, giving the original to the foreman. When the repairs are made this copy should be sent back to the supervisor, who should carry the same note book on the next trip to check up the foreman. A written report of that inspection should then be made.

In addition to these inspections the section foreman should make a personal inspection weekly, using a regular form and mailing it to the supervisor who, after checking, will combine it with the other reports for his subdivisions and send them to the division engineer who will have a competent man check them each week. The trackwalker should also look over the switches daily as he goes along, noting the conditions, but not opening the switches. Finally, every man in the department should be impressed with the importance of careful inspection to avoid any chance of accident.

To make sure that no switches are left open when making an inspection on foot, the track gage should be across the headblock in such a way that when the switch is thrown for the siding the gage will be under the lever. If the man making the inspection should forget the switch, he will observe its position when looking for the gage. When using a motor or hand car to inspect a facing point switch, the car should be brought to a stop ahead of it. If the switch is left open the motor or hand car will then go in the siding. In the case of a trailing point switch, the car should be stopped back of the switch. Then, if the switch is left open the motor or hand car will be derailed.

Foremen Should Inspect Switches Daily

By A. Antymink

Foreman, Canadian National, Riverhurst, Sask.

The switches require the very best maintenance to keep them in safe condition. The section foreman should personally inspect all switches once a day to insure that they are in perfect working order. He should examine all working parts of switches and stands to see whether they are working freely, all bolts and pins, to make certain that nuts are tight and the cotters in place, the switch points to see that the points fit squarely against the rail, the tie rods and point rails to see that they are properly connected, all connecting rods between the switch stands and switches to see that they are in first-class condition and to see that all pins which fasten the rods are protected from dropping out. Where the switch is operated from an interlocking plant the section foreman should also examine the rod and mechanism which connect the switch point to see that the rod is straight and that all other parts are in good condition. All movable parts should be oiled and if any parts of the switches are found defective, they should be repaired at once and a report made to the roadmaster and signal officer on the parts found defective.

Cleaning Up Yards

What is the most economical method of picking up debris in yards?

Use a Locomotive Crane

By P. Maisenbacher

Roadmaster, Elgin, Joliet & Eastern, Gary, Ind.

The problem of yard cleaning has received a great deal of study on this line where the yards serve the steel plants, and the debris is both large in volume and heavy. The present method is considered the most economical. A 15-ton locomotive crane is used with a bucket capacity of one yard. A foreman and 25 laborers scrape the dirt up and throw it in piles or winrows ahead of the crane. It is loaded into a car by the crane. When the car is loaded it is switched out on another track and an empty car is picked up by the crane. The cars are propelled by the crane until they are loaded, when a switch order is placed on the loaded cars to be set on the filling or dump track for unloading. The unloading is usually done by hand, but the dirt is leveled down with a dirt spreader. When the crane is not used in yard cleaning, it is used for loading and unloading other material. The crane is also used to load up all engine sand.

The Use of Calcium Chloride in Cement

What is the effect of adding calcium chloride to concrete? May it be used to advantage?

A Poor Protective from Freezing

By E. H. Brown

Supervisor of Bridges and Buildings, Northern Pacific, Minneapolis, Minn.

THE addition of calcium chloride to concrete in mixing water to prevent freezing is not generally to be recommended for the reason that its effect is limited to but a few degrees below freezing. Each pound of calcium chloride added to the mixing water lowers the freezing point approximately one degree F. The addition of the chloride up to about 10 per cent apparently does no harm, outside of accelerating the setting of the concrete but beyond this amount the strength of the concrete is evidently impaired. Even with the use of calcium chloride it is desirable to heat the water and the aggregates. The safe course to follow is to provide more direct means of protecting concrete from freezing than the use of calcium or sodium chloride.

It Is Valuable As a Curing Agent and Accelerator

Calcium chloride is used as an ingredient in concrete to reduce the time of setting and obtain greater strength during the earlier period of curing. It is used also to some extent to reduce the danger of freezing during winter concreting. But its widest application is for the purpose of protecting large areas of concrete exposed to the air and sun (as in the case of pavement) from the injurious effect of the rapid evaporation of its water content. Calcium chloride is used either in powdered or in flaked form. It is purchased either as a common

chemical or in the form of proprietary compounds, of which it constitutes the most important ingredient. When used as an "accelerator" or an anti-freezing compound, it is added to the concrete mixture in suitable proportions. It is used as a curing agent by spreading it uniformly over the surface of the concrete after the initial set has taken place.

It is generally conceded that calcium chloride possesses advantages in preventing the freezing of concrete, but its use for this purpose is not generally recommended, it being deemed much better practice to observe accepted rules for heating the materials and providing adequate protection for the concrete after it is placed in the forms. The use of calcium chloride as an accelerator has been definitely demonstrated by test. The time of setting is reduced in proportion to the amount of the material used. Proportions above four per cent by weight of the cement result in flash setting. Two per cent in average concrete mixtures will shorten the time of setting from 3½ hours to 2 hours, as determined by the Vicat needle, or from 5½ hours to 3 hours, as determined by the Gillmore needle. The increase in strength during the early periods of curing depends upon the proportion used and the character of the concrete mixture. For ordinary mixes of average consistency, two to three per cent of calcium chloride by weight of the cement will increase the strength from 100 to 200 lb. per sq. in. for all ages from two days to three years. For richer and dryer mixes the increase in strength will be much greater. For lean and wetter mixes its influence is practically negligible.

The use of calcium chloride within the limits of the proportions which have a favorable influence on the strength appears to have no injurious effect as regards other properties of the concrete such as soundness or permanence. A difference of opinion exists as to its effect on reinforcement. Some authorities prohibit its use in reinforced concrete because of the belief that it will corrode the steel. Others prohibit its use in pavements near electric lines or other places where it might be subject to stray electric currents.

Calcium chloride as a substitute for ponding or covering with earth, straw or hay as a protection for pavements from too rapid drying has been subjected to much study by state highway commissions and a number of these commissions have definitely endorsed its use for this purpose. Tests indicate that as good if not better results will be obtained with concrete cured by sprinkling the surface with calcium chloride as when protected by covering with straw, hay or earth. The protection afforded the concrete by a covering of this chemical is derived from its ability to absorb moisture from the atmosphere and thus provide a moist film over the surface of the concrete. This method of protecting concrete is much preferred by paving builders because the expense for the material and application is less than the cost of the other forms of protection. Following is a list of instructions issued by the Illinois Highway Commission for the application of calcium chloride to concrete surfaces. The principal requirement is that the chemical will be spread uniformly and that no unbroken lumps are allowed to remain on the surface.

"Calcium chloride may be used in connection with curing of pavements, taking the place of the usual curing with earth and water, or the curing with water by what is known as the 'ponding method.' Two and one-half pounds of the flaked or granular material (the flaked is preferred as it is more easily distributed and less easily removed by wind or rain) shall be applied to each square yard of pavement and it shall be distributed uniformly over the surface of the finished pavement by means of a mechanical drilling device or by the use of shovels and long-handled brooms. The material shall not be spread upon the pavement until the latter has thoroughly set—ordinarily from six to eight hours time after particular pavement has been laid.

"Calcium chloride shall not be applied during rains and experiments have definitely determined that if a rain follows the placing of the calcium chloride after a period of two or three hours there will have been enough absorption of the calcium chloride by the new pavement preceding the rain so that there will not be required additional applications of the material."

The Responsibility Toward Trespassers

What are the responsibilities of maintenance officers and foremen toward trespassers on railroad property, particularly bridges, in order to protect the railroad from liability for accidents to such persons, in addition to maintaining and installing the usual warning signs?

Warning Signs Not Enough

It is an impossibility to prescribe with any exactness just what is to be expected of each maintenance officer and foreman in protecting his railroad from liability for accidents to trespassers other than to install and maintain warning signs, for the simple reason that it is seldom that any two accidents are alike in all respects, and for the further reason, known only too well to those familiar with law suits, that no two juries are likely to act in the same way on a given statement of facts. Thus, a railroad may be held responsible for an acidddent to a trespasser in one case and not so in another case, depending upon the place, the circumstances, the particular laws in force where and when the accident occurred, the persons involved, the jury, the way the case is handled, etc. Likewise, the railroad may be held responsible for an accident on a bridge where it would not be held responsible for a similar accident on some other structure, or even a foreman may be subjected to criticism in one case where he would not be in another.

Of first importance, it should be impressed upon every officer that every accident is a source of expense to the railroad, whether it involves an employee or a trespasser. It makes no difference whether the railroad is to blame or not, some expense is involved just the same. Futhermore, this expense, however small, is quite apt to be larger than many of the savings which an officer can show by increased efficiency in his regular work, whether it is driving piling or renewing ties. Looking at it from this standpoint it may be said that aside from any humanitarian viewpoint or the desire to prevent suffering, each officer owes it to his company to consider every trespasser as a possible expense, whether he may think that trespasser deserves to get hurt because of his deliberate disregard of warnings or not. It is only necessary to examine the record of claims paid by railroads in a year to appreciate the force of this statement. It will be seen from this that an officer certainly has not lived up to his *opportunity* to serve his company merely by installing and maintaining warning signs in all cases where he knows further precautions are necessary and within his power to provide; but it is perhaps more important for him to know that the mere installation of signs may not relieve him from actual *responsibility*.

What the nature of this responsibility is in general is best illustrated by referring to a typical law suit involving a bridge where, notwithstanding the presence of warning signs, the railroad was held liable for the death of

a trespasser where it was shown that on previous occasions the railroad had knowledge of trespassing and had failed to prevent persons from crossing this bridge. In another typical case a railroad was held liable for the death of a trespasser crossing yard tracks, notwithstanding that a regular crossing was provided within a short distance, the responsibility of the railroad in this case having been based on the ground that a sufficient number of persons had been regularly crossing at this point unrestricted by the railroad as was indicated by the presence of a well worn path on the right of way, from which it was charged that the railroad was placed under the responsibility of anticipating further trespassing at this point. In another typical case a railroad was held liable for the death of a child killed while playing in the yards, notwithstanding the repeated effort made to compel children to keep off the property.

From these and other law suits it may be stated as general rules for the guidance of foremen: (1) That in no case should children be allowed on the right of way whether it takes the assistance of special agents or not to keep them off; (2) that foremen should never invite persons on the right of way who have no business there; (3) that occasional trespassers should be personally warned of their danger when it is convenient to give such a warning and ordered off the premises where possible; (4) that the superior officer should invariably be notified in all those cases where individual trespassers persist in crossing railroad property in spite of warning signs or personal efforts to keep them off, or where the property has become more or less a public thoroughfare.

By following these rules each officer will at least relieve himself from a responsibility for accidents that happen to trespassers, and may be the cause of saving the railroad from an expensive law suit.

Grading Ties for Renewals

To what extent is it practical to distribute ties when unloading them so that the larger and stronger ties will be available for insertion at the points of most severe service, as on curves and under joints?

Sorting Practical With Work Trains

By A. P. Everstine
Office of Chief Engineer, Bessemer & Lake Erie, Greenville, Pa.

The success of distributing ties so as to have the larger and stronger ties available at the points of greater wear hinges on the method of distribution and the manner in which the ties are loaded for final transportation to the point of installation. Where ties are unloaded at sidings or at some central point for distribution by trucking, the foreman, by noting in advance the requirements for each truckload, can pick out the desired sizes and place them on the truck in proper order for unloading. This method is greatly expedited, however, if the several groups and sizes are piled separately when first unloaded from the regular equipment.

Where ties are loaded in gondola or flat cars for direct distribution along the line, the larger and smaller sizes of the group to be distributed should be loaded in separate cars or in opposite ends of each car. Where a large gang is to be used for distributing ties in this way, the separate car method is preferable, while under circumstances where a small gang is employed it is found that the work can be done more efficiently from one car where the ties are loaded in separate tiers according to their size. Efficient tie distribution has been effected through the use of flat cars loaded with the different sizes of ties, attached to the regular local freight train in the required order of unloading. The flat cars are loaded from specifications furnished in advance by the foreman in charge, and the unloading in this case involves a minimum delay to the train.

It Is Practical if Done by Motor Car

By L. Coffel
Supervisor, Chicago & Eastern Illinois, Momence, Ill.

The practical way to grade ties according to their strength is to start at the treating plants by sorting them over and loading out the larger and stronger ties separate from the smaller. The time required to do this when handling the ties along the line with a work train would make the practice expensive.

The next best method is the one used at present on the Chicago Eastern Illinois, of distributing the ties with a push car previous to renewal, when the ties suitable for use under the joints and in curves can be distributed more economically than at any other time.

Only Practical When Done Before Unloading

By H. B. Hoyt
Assistant Roadmaster, Buffalo, Rochester & Pittsburgh, Punxsutawney, Pa.

It is not practical to sort ties when unloading them unless the larger or preferred ties are loaded separately from the others. The place to do the sorting of ties is at the treating plant or wherever the ties are loaded in cars. If this is done, then proper distribution can be made with little inconvenience and delay and at a great saving of labor. It will also insure, to a great extent, the proper ties are installed in the right place by making the work easier. For example, a work train can readily distribute both soft wood and hard wood ties for use on tangents and curves on a certain territory with practically no loss of time, provided the two kinds of ties are loaded separately. The chief delay would be the moving of men from car to car. Where the number of each kind of ties to be unloaded is about equal, the distribution can be made with separate gangs.

Sorting Important With Soft Woods

By F. J. Meyer
Assistant Engineer, New York, Ontario & Western, Middletown, N. Y.

The ties used at any point in the track should be good enough to meet the requirements at that point more nearly than any other ties that are available. If a road is fortunate enough to use nothing but creosoted oak ties little selection is needed other than what the section foreman might make in choosing joint ties. Most roads, however, do not receive creosoted ties altogether, but it is probable that they receive a variety of soft as well as hard wood ties. Under such conditions the ties should be distributed according to the service requirements. When soft ties are in general use the hard ties should be used on the heavy traffic curves or if there are not enough for the curves, then under the joints on the curves.

It must be remembered that soft wood ties treated will not withstand mechanical wear any better than untreated, and if they are used where they fail from mechanical wear it will be more wasteful than using them without treatment.

The question of the distribution of the best ties for hard wear seems to have arisen since woods of the

quality of white oak and long leaf heart pine became scarce. The more general use of treated ties has led many to use soft ties in place of hard ties and often little consideration is given to the question of mechanical wear until it is found that perfectly sound ties have failed on the spike line.

The objective should be to have ties good enough to meet service requirements and if the proper service cannot be secured out of the run of the ties as delivered, they should be sorted to get the best ties for the places where the service is most severe.

Superelevating Curves on Industry Tracks

Should superelevation be used on industry, house or other low speed tracks?

Some Elevation Preferred

By T. F. Donahoe

General Supervisor, Baltimore & Ohio, Pittsburgh, Pa.

This class of tracks can be operated safely without any elevation, but it is easier on the tracks, cars and locomotives to provide some elevation, the amount depending on the volume of business. There is no question but that a car will move over a curve easier with some elevation. It is difficult to lay down any set rule to apply to all conditions, but it is suggested that a short track, little used, should have from 0 in. to 1 in. elevation, and a track holding 5 to 6 cars should have from 1 in. to 2 in. elevation, while longer tracks should be given from 2 in. to 3 in. elevation. No elevation should exceed 3 in., and this should be provided only where tracks are long and cars run at faster speeds. There is no danger of a derailment at slow speed on level tracks of heavy curvature, so if no hard and fast rule is applied, 2 in. of elevation could be adopted as a safe rule to follow.

Elevate Only the Sharp Curves

By C. J. Lepperd

Supervisor, Reading, Pottstown, Pa.

A four wheeled truck having two parallel axles will always bind against the outer rail of a curve. The speed on industrial tracks rarely exceed 10 miles per hour and for a speed of less than that the theoretical superelevation required is so small that it may be neglected. On sharp curves of 10 deg. or over it is advisable to carry one inch of superelevation to reduce the binding of flanges against the outer rail. This small amount of superelevation will not put an excessive load on the low rail and will reduce the tractive force required to overcome friction against the high rail. On tracks where a speed of 10 miles per hour is exceeded the superelevation should be computed by the usual formula.

Leave All Switch Tracks Level

By L. M. Denney

Supervisor, Cleveland, Cincinnati, Chicago & St. Louis, Indianapolis, Ind.

In the construction of switch tracks serving industries, or freight or roundhouses where a speed of not more than 8 or 10 miles per hour is to be allowed, no elevation should be put in the tracks, regardless of the degree of curvature. Since elevation is provided in curves to neutralize the effect of centrifugal force thus keeping the center of the load in the center of the track and an equal load on each rail of the track, this force is so light that no elevation is necessary. It has been my observation that sharp curves constructed with elevation have more derailments than curves constructed with no elevation and switched at low speed.

Superelevation Causes Derailments

By T. Thompson

Roadmaster Atchison, Topeka & Santa Fe, Joliet, Ill.

No superelevation should be given sharp curves of industry or house tracks. The tracks should be level. Taking out superelevation and keeping tracks level will prevent derailments. The elimination of superelevation will also prevent the inside rail on curves from turning over, cutting into the ties and spreading as it usually does.

Level Tracks Cheaper to Maintain

By R. L. Sims

Roadmaster, Chicago, Burlington & Quincy, Chicago

On the Chicago division of the Burlington are 368 industries, the majority of which are located with curves varying from 1 to 28 deg. My experience has been that it is more economical to maintain these tracks without any elevation where the speed is from 5 to 15 miles per hour, which is about the range of speed over them.

If such tracks are given elevation they will gradually take more elevation by reason of the traffic over them, and in time the tracks will attain too much elevation for the degree of curvature. Where the curves are elevated the tracks are also more difficult to keep in gage and line. In Chicago there are many set-backs to handle, these being cars which are partly unloaded or partly loaded. In many cases the load is on one side of the car and in handling such cars the tendency is for the car to climb the high rail, whereas if the track has no elevation there is less likelihood of derailments of this kind. Better drainage is also secured where both rails are on the same level. If there is elevation the low rail gets all the water which, on account of the ballast becoming soft, causes the track to take on more elevation. In the majority of cases industry tracks are provided with little or no drainage.

Superelevation Detrimental

By H. B. Hoyt

Assistant Roadmaster, Buffalo, Rochester & Pittsburgh, Punxsutawney, Pa.

On low speed tracks the superelevation should be entirely eliminated. In loading cars at platforms, it is much more satisfactory to load when the car floor is level and not tipped at an angle. Also, excessive elevation on low speed tracks throws the weight of the cars against the low rail, causing the tracks to bind, and the wheels to mount the rail with consequent derailment. The weight of the equipment will be more uniformly distributed on each rail without superelevation which will tend to keep the wheels on the track and eliminate the uneven wear of the rail.

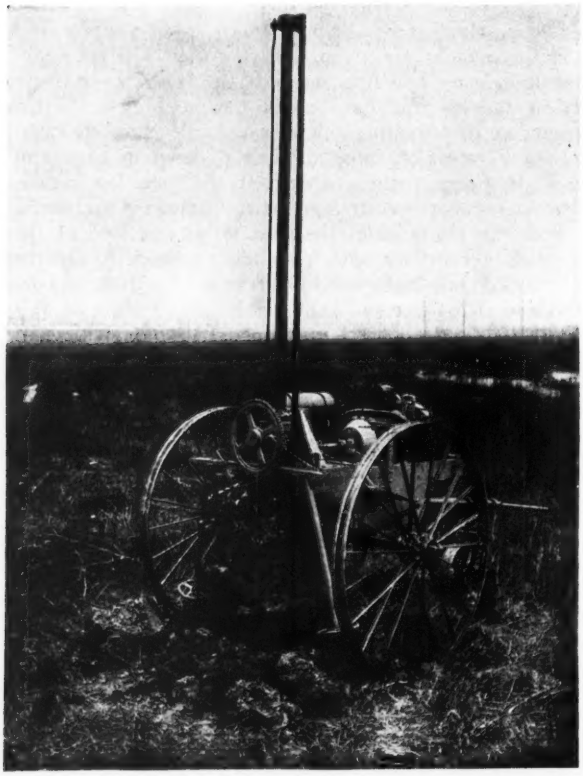
In thoroughfare tracks through yards where the speed may be somewhat greater or in slow speed freight tracks, it is advisable to put in elevation, based on the average speed of the trains, but care should be used not to make the elevation at all excessive—so that very slow movements can still be made without trouble. Yard, thoroughfare and similar tracks should be given not to exceed two inches of elevation.

New and Improved Devices

A Power Post Hole Digger

TO MEET the demand for power digging of holes for telegraph or other poles and fence posts the Buda Company, Chicago, has designed the Buda-Hebron earth drill, which combines ample power with ready portability. It will dig in earth, clay, hardpan or shale, and will handle without difficulty the small stones ordinarily encountered.

The power unit is a standard Buda gasoline engine of the four cycle, horizontal, two-cylinder opposed, air cooled type, with a four-inch bore and four-inch stroke. It is equipped with a high tension magneto and a gear oil pump with a positive feed.



The Post Hole Digger at Work

The drill proper is held in a specially designed chuck and is fed by hand, while it is raised by power. The earth drills, ranging in size from 8 in. to 20 in. in diameter, are made of a single cast steel helix, to which removable manganese and carbon-steel cutters are bolted, thus providing for easy renewals. The helix is polished on the top and is provided with a special check valve.

When the drill is in action the loosened earth is forced upward through the check valve and rests on the polished top of the helix, but does not turn with it owing to the slight friction between the loosened earth and the polished surface on which it rests, this feature enabling practically all of the power applied to be expended in drilling.

When the drill has dug about two feet the drive clutch is disconnected and the drill is raised to the surface by the lifting clutch, when the drive clutch is again applied and the dirt is thrown off the helix by centrifugal force which carries it around the edges of the hole. A special chuck and drill are provided for blast hole work which will drill a hole 1½ in. in diameter and 15 ft. in depth. The speed of drilling depends on the character of the ground but in ordinary soil it is said that a 20-in. hole may be sunk seven feet in about five minutes. The machine will dig from 50 to 60 fence post holes in a day, and in blast hole work in shale it averages from 140 to 180 ft. a day.

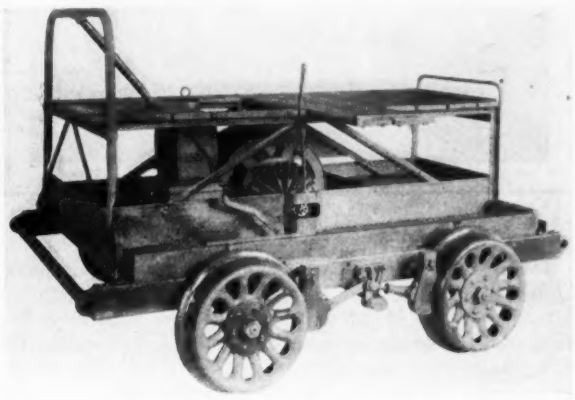
The machine is provided with springs so that it will move upward when an obstruction is suddenly encountered, thus relieving it from excessive strains, while the driving clutch is of the friction type, permitting it to slip before the strain on the drill becomes too great.

The machine is mounted on two wheels, each four feet in diameter, fitted with wide tires and roller bearings. The weight is 1,400 lb. and it may be handled on smooth ground by one man. It may be moved to the work on a motor car or motor truck, or may be hauled behind an automobile. The machine can be used on rough or uneven ground as it may be adjusted to drill at any reasonable angle by changing the position of the tongue post.

Attractive Claims Made For New Section Car

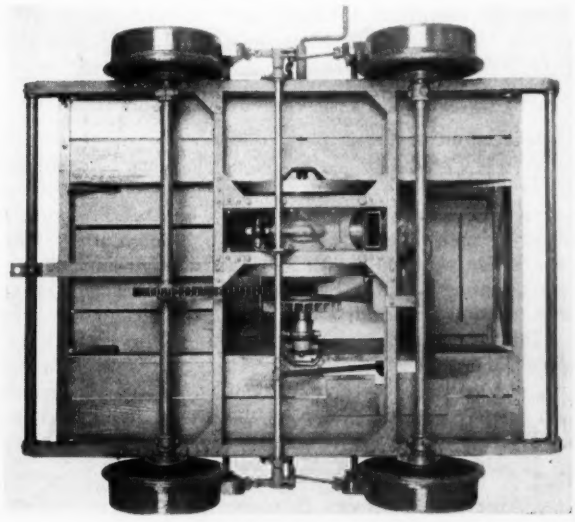
FAIRBANKS, MORSE & COMPANY, Chicago, have recently develoed a section car which is in one respect a proposal to prove that a clutch has been developed which not only can be allowed to slip but which in so doing actually reduces upkeep and promotes dependable operation in motor cars. The objective underlying the development of this car has been to produce low priced equipment for ordinary section work which can be run without the upkeep costs which are associated with motor car operation. On the theory that this maintenance in the engine and in the car arises chiefly from weaknesses in the method of transmitting the power from the engine to the drive wheels the manufacturer has undertaken to meet this problem through the agency of a slip clutch. This clutch comprises two parts, one part consisting of a casting that resembles a pulley wheel in that it has two faces of large diameter cast integral with each other but separated some distance apart by a core of smaller diameter. This casting runs free on the extended drive shaft of the engine immediately outside of one of the engine drive wheels which is faced to permit

an intimate contact with the adjacent face of the clutch casting. The opposite face of this free-running casting fits against a second clutch casting which is keyed to the shaft in such a way that it can be shifted by means of a lever to bring it against the face of the first casting. The free running casting carries a sprocket chain which runs directly to a sprocket on the drive axle of the car.



The Clutch Side of the New Section Car

As distinguished from the so-called friction disc transmission where there is no slipping but simply the means of varying the speed of the car by shifting the transmission disc back and forth over a drive disc, in this car the speed is determined by the extent to which the friction surfaces are in contact with each other. Thus in cases where the engine is traveling at constant speed and it is desired to start the car this is accomplished by



A View of the New Transmission

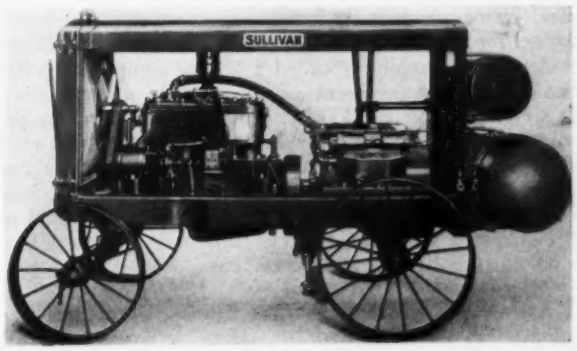
letting the clutch slip until there is no more danger of killing the engine or where the load on the car or the grades are such that there is insufficient power in the engine to run at high speed the clutch is kept in the slipping position.

In the new clutch the friction surfaces, it is said, may be used for long periods without suffering from wear, partly because of the material and large diameter of the friction surfaces, and also on account of the presence of fins on the thrust casting, which, because of the increased surface of radiation they give to the casting and the fan-like effect of their movement with the shaft, prevent overheating of the clutch from the friction developed while the clutch is slipping. Only slight pressure is required to control the pressure between the surfaces or to bring the clutch into full engagement while at the same time excessive pressure cannot injure the mechanism. When worn they can be quickly replaced without dismantling the engine. In a recent test of the clutch, when the engine was operated at maximum horsepower, the clutch was slipped 10 hours a day for a week without giving trouble or showing appreciable wear. Because of its construction the clutch is said not only to bring less wear and tear on the engine by avoiding shocks, but offers the means of eliminating the annoyance and expense in operating cars where the transmission is less protected from shock and the effects of weather or from the strain which results from the effort to carry exceedingly heavy loads. Emphasis is also placed upon the statement that while the clutch is designed to slip when desired it is proof against slipping when it is desired to keep the clutch tight.

The car also carries a new type of engine which is a single cylinder two cycle water cooled type power unit rated at 7 hp. and delivering 11 hp. at 1,000 r.p.m., also an automobile type of pressed steel frame and a rear axle which consists of a specially tapered forging which increases from 1 7/16-in. in diameter at the bearing to 2 7/16-in. in diameter at the center, this to eliminate the necessity for a center bearing and the consequent trouble of keeping three bearings in alinement. The engine has a water hopper cast integral with the cylinder to avoid leaking and carries the spark plug where it is accessible without requiring the removal of any parts to reach it. The deck of the car provides a box at each side for tools and is detached by the removal of but four bolts in the frame, no part of the engine or operating levers being fastened to the deck. The car, the Sheffield No. 44, weighs 1,035 lb., will carry nine men and allows a speed of 25 miles per hour.

Vibration Reduced in New Air Compressor

A PROBLEM facing the manufacturers of portable air compressor machinery has been the development of some way to avoid excessive vibration for the obvious reason that this vibration materially shortens the life of the equipment and leads to extra upkeep, entirely

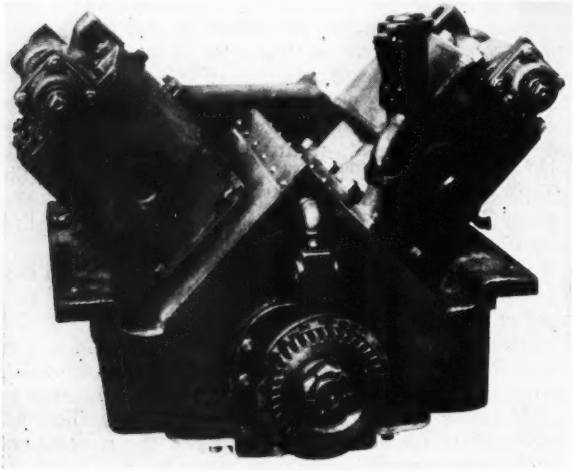


The V Type Air Compressor

aside from the necessity for providing heavier equipment than might be necessary with smoother running machinery. In view of this problem it is interesting to note the method which has been adopted for reducing vibration in a new portable air compressor which has been developed by the Sullivan Machinery Company.

The problem in this case was to meet the demand for

a portable compressor of much larger capacity than prevailing types, which made it imperative to give special attention to preventing any increase over the amount of vibration which is experienced in smaller machines. This problem is claimed to have been met satisfactorily in the new compressor (which produces 220 ft. of air per minute, or double the capacity of the smaller Sullivan units), by providing a four cylinder compressor unit in which the cylinders, instead of being arranged in a line vertically, are arranged in pairs with each pair inclined outward 45 deg. from the vertical, thus bringing each pair at right angles with the other. This 90 deg. arrangement of the cylinders provides a counterbalancing effect similar to that which has proved successful in the angle compound compressors which are manufactured by this company for stationary plants. In building this unit, the same size of compressor cylinders are utilized as in the 110-ft. compressor, namely, 5½-in. diam. cylinders with a 5-in. stroke, single acting, and the pairs of cylinders are slightly offset lengthwise from each other to permit their operation from a single crank shaft.



A View of the Compressor Unit Showing the V Arrangement of the Cylinders

As with the 110 ft. compressor this machine is direct-connected to a Buda four cylinder, four cycle gasoline engine of 43 hp. which drives the compressor at 800 r.p.m. The engine and compressor are bolted to a cast steel frame which is equipped with a water radiator and a steel top, and carries the necessary fuel and air storage tanks. The machine is called a V type compressor after the angular arrangement of the compressor cylinders. It weighs complete 5,360 lb., produces 220 ft. of air per minute, and is adapted for operating two to three rock drills, three to four concrete breakers or tampers and seven to nine riveters or clay spaders, etc. It is the claim of the company that the new machine, when mounted on the standard steel wheel truck, runs with as little vibration as if bolted to a concrete base.

A NEW SAFETY SLOGAN—"All Alive in 1925!" has been adopted as the slogan of the safety department of the Long Island Railroad for the coming year. This slogan has resulted from the success of the Long Island in avoiding any fatal accident to an employee during eight months of 1924. As an inducement for vigorous efforts during the coming year in accident prevention a score board record of time injuries is planned which is to be posted conspicuously by each department and arrangements have been made to award prizes at the close of the year for the best record on a basis of the man-hours worked.

With the Associations

Metropolitan Track Supervisors' Club

The members of the Metropolitan Track Supervisors' Club will meet at the Hotel Martinique for lunch on Saturday, April 11, at which time James Maybury, Jr., will speak on grade crossing protection. Following this S. J. Malloy, division engineer, Erie, Jersey City, N. J., will present a paper on The Protection of Switch Points by Housing, Staggering and Curving.

Bridge and Building Association

The proceedings of the thirty-fourth annual convention, which was held in Kansas City last October, are now in the hands of the printers and will go in the mail early in April.

Approximately 25 officers and members of the association met at lunch in Chicago on March 11 during the convention of the American Railway Engineering Association to discuss the work of the association. All but two of the committee chairmen were present and reported on the work of their committees, indicating that this work is making satisfactory progress.

Wood Preservers' Association

On account of the growth of the work of the American Wood Preservers' Association, the office of secretary has been divorced from that of secretary-manager of the Service Bureau and E. J. Stocking has been appointed secretary with office at 111 West Washington street, Chicago, effective April 1. P. R. Hicks will continue as secretary-manager of the Service Bureau of the association with office at 10 South La Salle street, Chicago, devoting his full time to the work of that organization. The Executive Committee of the Wood Preservers' Association has also reconsidered the action taken at the annual convention relative to the location of the next meeting and has selected Cleveland for the convention which will be held on January 26-28, 1926.

American Railway Engineering Association

Prompt work on the part of the Board of Direction of the Association is evidenced by the issuance of an announcement on March 26, covering the assignment of subjects to the regular standing committees and the personnel of these committees. With this information in the hands of the various committee members within less than three weeks of the closing of the last convention it is possible for the committees to proceed with the work for the coming year without loss of time. The roster of committees include only two new committee chairmen: W. J. Burton, Committee on Ties, and J. V. Neubert, Committee on Track.

An outline of the subjects assigned to the committees, together with the names of their chairmen, follow, sub-

jects assigned for the first time this year being shown in italics:

Roadway—Economics of filling; corrugated metal culverts; unusual methods of handling roadway problems in connection with slips, slides and water pockets; *various deformations of roadbed in light of information developed by Committee on Stresses in Track; the best methods for drainage of roadway in yards or on main lines where there are three or more tracks.* C. M. McVay, division engineer, New York Central Lines, Charleston, W. Va.

Ballast—Design ballast fork to take the place of the 15-tine fork; specifications for washed gravel ballast; D-handle for ballast forks and shovels; relative value as ballast of stone from various quarries, method of determining; relative value from the standpoint of effect upon operating expenses of various kinds of ballast; shrinkage of ballast; proper treatment, from the standpoint of ballast, of track in paved streets or at paved street and highway crossings; cause of pumping joints; effect upon the life of ties, both treated and untreated, in various kinds of ballast, giving special attention to the effect of various kinds of slag. F. J. Stimson, chief engineer maintenance, Southwestern region, Pennsylvania, St. Louis, Mo.

Ties—Use of dating nails and specifications for dating nails; substitute ties under test and design of a substitute tie; the use of foreign woods for cross-ties; service test records, conferring with the Committee on Wood Preservation; *marking of ties for recording service;* anti-splitting devices for ties; *the proper size hole to bore for each size of spikes; the extent to which A.R.E.A. tie specifications are being followed.* W. J. Burton, assistant valuation engineer, Missouri Pacific, St. Louis, Mo.

Rail—The design for track bolts, including corresponding joint bar punching; details of mill practice and manufacture as they affect rail quality; fair and accurate methods of reporting rail failures; transverse fissures; the effect of various bolt tensions on the mechanical strength of joints; the cause and prevention of rail battering; gas welding of propulsion and signal bonds; *revise specifications for spring washers;* the effect of various intensities and repetitions of wheel loads upon rail; *the economic value of different sizes of rail; specifications for girder rails, collaborating with Committee on Track.* G. L. Moore, engineer maintenance of way, Lehigh Valley, Bethlehem, Pa.

Track—Plans of switches and frogs, crossings, and slip switches, *including plans of flange or self-guarding frogs,* conferring with Committee on Signals and Interlocking; specifications and design of wooden handles for track tools; the effect of brine drippings on track appliances and tests of tie plates subject to brine drippings; canting rail inward and taper of tread of wheels; methods of determining recommendations for rail renewals; plans for tie plates; collaborate with Rail committee on cause and prevention of rail battering; track construction in paved streets, collaborating with Committee on Rail on specifications for girder rails; the use of nutlocks for rail joints, with special reference to heat treated bolts of large diameter. J. V. Neubert, engineer maintenance of way, New York Central, New York City.

Buildings—Freight house design; specification for buildings for railway purposes; ventilation of railway buildings, except enginehouses; ornamental roof coverings for passenger stations; *the design and construction of water station buildings, collaborating with Committee on Water Service.* W. T. Dorrance, designing engineer, New York, New Haven & Hartford, New Haven, Conn.

Wood Bridges and Trestles—Co-operate and collaborate with other organizations in simplification of grading rules and classification of timber and lumber for railway uses; *the value of treated timber in wooden bridges and trestles; the best methods of maintaining at a minimum consistent with economy, the quantity and multiplicity of sizes of lumber and timber carried in railway stock;* the useful strength of new, old and treated timber when used in railway trestles. A. O. Ridgway, chief engineer, Denver & Rio Grande Western, Denver, Colo.

Masonry—Developments in the art of making concrete; specifications for various aggregates used for concrete, collaborating with producers to bring about better and more uniform products; study report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete. C. C. Westfall, engineer bridges, Illinois Central, Chicago.

Signs, Fences and Crossings—Crossing signs; the methods of apportioning the cost of street and highway improvements adjacent and parallel to railway rights-of-way; the elimination of highway grade crossings; improved methods of preventing corrosion of fence wire; *specifications for steel fence posts; the use of Kentucky "rock asphalt" as a substitute for planking in road crossings.* T. E. Rust, chief engineer, Waterloo, Cedar Falls & Northern, Waterloo, Iowa.

Signals and Interlocking—Collaborate with other committees in work involving signaling; automatic train control; signals for highway crossing protection. F. B. Wiegand, signal engineer, New York Central, Lines West of Buffalo, Cleveland, Ohio.

Records and Accounts—Methods and form for gathering and recording data for keeping up to date the physical and valuation records of the property of railways; feasibility of reducing the number of forms used in engineering and maintenance of way department; methods for recording and accounting for the determination of proper allowances for maintenance of way expenses due to increased investment, collaborating with the Committee on Economics of Railway Operation revision of theI.C.C. Classification of Accounts; comparison of daily and monthly time and material reports. H. M. Stout, record engineer, Northern Pacific, St. Paul, Minn.

Rules and Organization—"Manual of Rules for the Guidance of Employees of the Maintenance of way Department." W. C. Barrett, trainmaster, Lehigh Valley, Sayre, Pa.

Water Service—Regulations of federal and state authorities pertaining to drinking water supplies, collaborating with United States Public Health Service and other organizations concerned; pitting and corrosion of boiler tubes and sheets; the cost of impurities in locomotive water supply and the value of water treatment, together with comparisons of the different methods and a study of the costs of blowing off, washouts and water changes; the relative merits of the different methods of deep-well pumping; the design, construction and maintainance of pipe lines, *collaborate with Committee on Buildings in the design and construction of water station buildings; the use of hot-water boiler washing plants as affecting the water supply, the amount of water used and wasted, requiring storage to minimize waste and the possibilities of reclaiming waste water; methods of heating water stations and protecting tanks, water columns and other water facilities against frost.* C. R. Knowles, superintendent water service, Illinois Central, Chicago.

Yards and Terminals—The joint operations of passenger terminals: scales —automatic indicating devices for weighing, tolerances for railway service weighing devices, *tolerances for testing, adjusting and maintaining railway track scales; capacity for motor truck scales; analysis of Bill H. R. 4465 to regulate and control the manufacture, sale, and use of weights and measures and weighing and measuring devices for use or used in trade or commerce, and for other purposes;* freight yard design, suggesting economies in operation; *layout for icing cars, etc.;* the proper size and arrangement of large passenger station facilities as determined by the business handled; *mechanical means for controlling or retarding the movement of cars in hump yards.* J. R. W. Ambrose, chief engineer, Toronto Terminals Railway, Toronto, Ont.

Iron and Steel Structures—Specifications for steel highway bridges; the electric welding of connections in steel structures; rules for lighting bridges and a uniform code of regulations and signals for operating drawbridges, conferring with the Committee on Signals and Interlocking; the maintenance of bridges, including equipment for that purpose; rules for field inspection of existing bridges; investigations and tests of I-beams connected in groups by diaphragms and bracing; tests and study of the behavior of bridge pins; column tests; methods of water-proofing and draining solid floor bridges, with specifications, conferring with the Committee on Masonry; *investigation of copper-bearing steel for structural purposes; collaborate with the Committees on Water Service and Shops and Locomotive Terminals on specifications for the design, fabrication and erection of steel tanks, tower supports, etc., for the storage of water and oil.* O. F. Dalstrom, engineer of bridges, Chicago & Northwestern, Chicago.

Economics of Railway Location—The economics of railway location as affected by the introduction of electric locomotives, conferring with the Committee on Electricity; locomotive tractive force, *giving special attention to oil-burning locomotives* and collaborating with the appropriate Committee of Division V—Mechanical, American Railway Association; the relative merits of increasing tonnage by the reduction of ruling grades, or by the introduction of more powerful locomotives, including consideration of momentum grades and the availability of the locomotive booster; *the relative merits of a 0.4 per cent ruling grade as compared with a 0.3 per cent grade.* E. E. King, professor railway civil engineering, University of Illinois, Urbana, Ill.

Wood Preservation—Treatment of Douglas fir; preservative treatment of signal trunking and capping, collaborating with Committee on Signals and Interlocking; treatment with creosote and petroleum; treatment with zinc chloride and petroleum; service test records; marine piling investigation. S. D. Cooper, assistant manager treating plants, Atchison, Topeka & Santa Fe, Topeka, Kan.

Electricity—Electrical interference caused by propulsion circuits, including recommendations for eliminating interference with signal, telephone and telegraph lines caused by propulsion with signal, telephone and telegraph lines caused by propulsion circuits and adjacent transmission lines; continue representation on the American Committee on Inductive Coordination and collaborate with the appropriate committees of the Telephone and Telegraph section and with the Signal section; the utilization of water power for electric railway operation; collaborate with the American Committee on Electrolysis; collaborate with the United States Bureau of Standards in the revision of the National Electrical Safety Code and other codes of similar character; electric light; power supply and trolley lines crossing railways; continue the state representatives and their alternates; report on the specifications for the construction of overhead electric supply lines for railway use on railroad property, collaborating with the appropriate committees of the Signal Section and the Telephone and Telegraph section; economics of railway location as affected by electric operation, collaborating with the Committee on Economics of Railway Location; report on the specifications for adhesive and rubber tapes; report on specifications for porcelain insulators for railway supply lines, collaborating with the appropriate committees of the Signal section and the Telephone and Telegraph section; *revise the "Tables Showing Third Rail Clearances and Tables Showing Overhead Working Conductor Clearances" contained in last year's report;* report on rules for the protection of oil sidings from danger due to stray currents; *specifications for track and third rail bonds for electric railway circuits, including gas, electric and thermit welding; revise and bring up to date the adopted specifications for incandescent lamps and schedule of sizes.* Edwin B. Katte, chief engineer, electric traction, New York Central, New York City.

Uniform General Contract Forms—Forms of agreement for purchase of electrical energy, for joint use of freight station facilities, for joint use of poles on railway right-of-way, for furnishing water from railway water systems to employees or others and for the purchase of water; *form of maintenance bond; forms of agreement for furnishing and boarding men and for use of railway property for public highways.* W. D. Faucette, chief engineer, Seaboard Air Line, Norfolk, Va.

Economics of Railway Operation—Effect of speed of trains upon the cost of operation; methods of increasing the traffic capacity of a railway; methods of analyzing costs for the solution of special problems, including a study of the costs of starting and stopping trains; the utilization of locomotives to determine the percentage of time they should be available to perform actual transportation and methods for obtaining maximum efficiency while so available; collaborating with other divisions and sections of the American Railway Association; *methods of operation by which the intensive use of facilities may be secured; develop suitable units for comparing costs of operation and equipment maintenance.* G. D. Brooke, assistant to vice-president, Chesapeake & Ohio, Richmond, Va.

Economics of Railway Labor—Standard methods for performing maintenance of way work and establishment of units of measure of work performed; *the extent to which it is practicable to stabilize employment in the maintenance of way department in the interest of efficiency, and the necessary measures; methods of maintaining motor cars; economy in use of labor-saving devices; educating and training maintenance of way employees.* C. C. Cook, maintenance engineer, Baltimore & Ohio, Baltimore, Md.

Shops and Locomotive Terminals—General layouts of engine terminals; general layouts and designs of car shops and coaling stations; storehouses for shops and locomotive terminals; ventilation of enginehouses; general layouts and design of typical locomotive repair shops. F. E. Morrow, assistant chief engineer, Chicago & Western Indiana, Chicago.

Co-Operative Relations With Universities—A greater interest upon the part of railroad officers in assisting the universities to develop the best possible methods for the technical courses; a better means of bringing to the universities the results of our deliberations, where such can be made of value to them; a better means of bringing to the attention of the railroads the benefits of a technical education, thereby acquainting them with the qualifications of graduates of these courses for initial service in subordinate positions, and at the same time providing material from which men may be drawn for higher positions as they demonstrate their fitness; a means of stimulating a greater interest in the science of transportation among engineering students who may be inclined toward this branch of industry; a means whereby the facilities of the universities may be made more directly available for the research work of the Association by co-operative effort between their laboratories and the com-

mittees of the Association; a means whereby the universities may be better enabled to educate the students and the public regarding the value of transportation as a whole; a means of stimulating a greater interest among university officials in the study of transportation and economics and impressing them with the importance of experienced men for such teaching. R. H. Ford, assistant chief engineer, Chicago, Rock Island & Pacific, Chicago.

Special Committee on Stresses in Railroad Track—Continue the study of stresses in railroad track. A. N. Talbot, professor municipal and sanitary engineering, University of Illinois, Urbana, Ill.

Directory of Associations

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, Buffalo, N. Y., October 20-22, 1925.

AMERICAN RAILWAY ENGINEERING ASSOCIATION (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Annual convention, Congress Hotel, Chicago.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—P. R. Hicks, secretary, Room 1146 Otis Bldg., Chicago. Next convention January, 1926, Cleveland, Ohio.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—B. J. Wilson, Pocket List of Railroad Officials, 605 Fisher Building, Chicago. Annual exhibit at convention of American Railway Bridge and Building Association.

NATIONAL ASSOCIATION OF RAILROAD TIE PRODUCERS.—J. S. Penney, secretary, T. J. Moss Tie Company, St. Louis, Mo. Next convention January, 1926, Hot Springs, Ark.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—C. W. Kelly secretary, Seeberger Building, 825 South Wabash avenue, Chicago. Annual exhibition at convention of American Railway Engineering Association.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—T. F. Donahoe, secretary, B. & O., Pittsburgh, Pa. Next convention September 22-24, 1925, Kansas City, Mo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo-Ajax Corporation, Hillburn, N. Y. Annual exhibit at convention of Roadmasters' and Maintenance of Way Association.

The Material Market

WITH HEAVY competition between producing territories and some evidence of foreign competition, with prompt deliveries and a growing tendency to take business at old prices lower than those now quoted, the conditions in the iron and steel market are generally favorable to the purchaser. The effect of this is for the buyer to restrict orders to quantities required for immediate use, depending on the future to afford equally favorable figures. While foreign competition has not become a serious factor, for few actual orders have been placed abroad, it has become a matter of some concern to the manufacturers and has given rise to more or less speculation as to the possibilities of securing an increase in the protective tariffs.

As seen in the table below, quotations have not changed except for reductions in the prices of plates, shapes and bars in the Pittsburgh district and of cast iron pipe. However, this does not tell the whole story, since some products are not moving readily at the present quotation, and this condition has led some manufacturers to accept orders at the lower prices prevailing before current quotations became effective. This has been notably the case with wire products, and to a lesser extent with track fastenings in the territory included in the Pittsburgh district.

However, in spite of the current weakness of prices, the market continues active and production is proceeding on a rather generous scale. The well known index of the iron and steel market, namely the unfilled orders of the United States Steel Corporation, show that the unfilled orders on February 28, totaled 5,284,771 tons as compared with the record low figure of 3,187,072 tons for July 31, 1924. In fact, the total on February 28, is the highest since August 31, 1923.

PRICES PER 100 LB.

	February		March	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$2.90 to $3.20	$ 3.00	$2.90 to $3.20	$ 3.00
Track bolts	3.90 to 4.25	4.00	3.90 to 4.25	4.00
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel	2.35 to 2.50	2.45	2.35 to 2.50	2.45
Boat spikes	3.25	3.25	3.25	3.25
Plain wire	2.60 to 2.70	2.70 to 2.80	2.60 to 2.70	2.70 to 2.80
Wire nails	2.85 to 2.95	2.95 to 3.05	2.85 to 2.95	2.95 to 3.05
Barb wire, galv.	3.55 to 3.65	3.65 to 3.75	3.55 to 3.65	3.65 to 3.75
C. I. pipe, 6 in. to 12 in., ton		50.20		47.20
Plates	2.00 to 2.20	2.30	2.00 to 2.10	2.30
Shapes	2.10 to 2.20	2.30	2.10	2.30
Bars, soft steel	2.10 to 2.20	2.20	2.10	2.20
Rivets, struct.	2.60	2.75	2.60	2.75
Conc. bars, billet	2.10 to 2.20		2.10	
Conc. bars, rail		2.10		2.10
Open hearth rail, per gross ton, f. o. b. mills		43.00		43.00

The scrap market is still in an inactive state and has experienced a further softening of prices as indicated in the table below:

PRICES PER GROSS TON AT CHICAGO

	February	March
Relaying rails	$26.00 to $31.00	$26.00 to $31.00
Rails for rerolling	19.50 to 20.00	18.00 to 18.50
Rails less than 3 ft. long	20.50 to 21.00	19.00 to 19.50
Frogs and switches cut apart	18.50 to 19.00	17.00 to 17.50
Steel angle bars	19.00 to 19.50	18.00 to 18.50

The conditions outlined above for the iron and steel market are in a large measure duplicated in the lumber market except that the softening of prices is more definitely apparent in quoted figures as is evidenced in the tables below. Orders in the hands of the southern pine mills at the beginning of March totaled substantially the same as for the corresponding period in 1922 and 1924, but represent less than 60 per cent of the volume of unfilled orders at the beginning of March, 1923. On the west coast, manufacturers are endeavoring to effect a satisfactory relationship between production and orders by restricting operations to four days a week.

SOUTHERN PINE MILL PRICES

	February	March
Flooring, 1x4, B and B flat	$49.75	$48.85
Boards, 1x8, No. 1	36.74	38.70
Dimension, 2x4, 16, No. 1, common	30.13	29.56
Dimension, 2x10, 16, No. 1, common	32.65	30.37
Timbers, 4x4 to 8x8, No. 1	31.29	29.38
Timbers, 3x12 to 12x12, rough	42.17	38.49

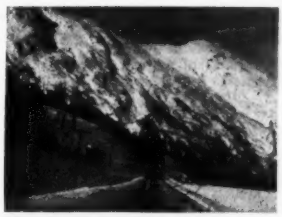
DOUGLAS FIR MILL PRICES

	February	March
Flooring, 1x4, No. 2, clear flat	$38.00	$35.00
Boards, 1x8, 6 to 20, No. 1, common	18.50	18.50
Dimension, 2x4, 16, No. 1, common	20.50	19.50
Dimension, 2x10, 16, No. 1, common	20.00	19.00
Timbers, 6x6 to 8x8, No. 1, common	25.00	23.00
Timbers, 10x10 to 12x12, rough	18.00	18.00

Current prices for Portland cement in carload lots not including packages are given below. These prices indicate no change from those quoted in last month's issue.

New York	$2.15	Minneapolis	$2.42
Pittsburgh	2.19	Dallas	2.05
New Orleans	2.40	Denver	2.84
Chicago	2.20	San Francisco	2.61
Cincinnati	2.47	Montreal	1.80

TORNADO PROVES DISASTROUS—At least 40 employees were killed and over $2,000,000 of property lost on the Southern, the Mobile & Ohio, the Chicago & Eastern Illinois, the Missouri Pacific, the Chicago, Burlington & Quincy and the Illinois Central when one of the worst tornadoes in history swept over southern Illinois and Indiana on Wednesday, March 18. The Southern was the most heavily damaged, its shops at Princeton, Ind., being completely wiped out with a loss estimated at over $1,000,000. At Murphysboro, Ill., the shops of the Mobile & Ohio were totally destroyed and 29 employees killed. The Illinois Central's bridge over the Big Muddy river was shifted six feet out of line. All the railways entering the damaged territory placed their resources at the disposal of Red Cross and other agencies which carried aid to the injured and homeless. More than 50 special trains carrying doctors, nurses and supplies were operated by the Illinois Central alone from a number of points on its line.



News of the Month

The Louisville & Nashville has begun the publication of an employees' magazine, the first issue of which commemorates the diamond jubilee of the company. The editor of the magazine is Thomas E. Owen.

An illustration of the value of automobile block signals from other standpoints than that of improving train operation and increasing track capacity has been afforded in the history of the 2,225 miles of signals on the Northern Pacific, which discloses that as high as 581 broken rails have been detected by these signals in a single year, to say nothing of the many cases of open switches and cars fouling main track which have also been detected since the first signals were installed 14 years ago.

The average consumption of coal per thousand gross ton miles of road freight service in 1924 was 12 lb. less than consumption for this purpose of 1923, when the previous record for economy was made. The coal saved in road service by this reduction was 6,514,590 tons, which is equivalent to a saving of about $19,870,000 with the storage price of coal at $3.05. It is estimated that the total saving accomplished by Class I roads in 1923, solely from increased efficiency in the use of coal, was about $29,500,000, notwithstanding the slightly larger volume of freight service rendered.

On March 11, the Chicago, Milwaukee & St. Paul was placed in the hands of receivers by an order of the Federal Court at Chicago, owing to the threatened inability of this company to pay off, in a manner satisfactory to bondholders and bankers, a loan of approximately $48,000,000 in the form of bonds which come due on June 1. H. E. Byram, formerly president of the company, Mark W. Potter, until recently a member of the Interstate Commerce Commission and Edward J. Brundage, former attorney general of Illinois, were appointed receivers by the court. The operation of the road will continue under its present officers.

The right of the Pennsylvania to refuse to comply with orders of the Railroad Labor Board as to the method of selecting representatives of its employees to serve on committees to deal with the management and to refuse to recognize, as such representatives, officers of such unions not employees of the company was established by the Supreme Court in a case where injunctions were sought to force the railroad to comply with the labor board's orders. A decision was rendered on the basis, as stated by the court, that nothing in the Transportation Act establishing the labor board indicates that Congress intended that railroad companies or their employees were in any way to be forced into compliance with the statute or with the judgment pronounced by the labor board except through the effect of public opinion.

Statistics of the Interstate Commerce Commission for the year 1924 show that the number of employees in the maintenance of way department during that year varied from a minimum of 335,449 in February to a maximum of 428,917 in August, which is a variation of 93,469 employes. As compared with these figures, the number of employees in the maintenance of way and structures department of the Class I roads for 1923 is shown to have varied from a minimum of 326,627 in February to a maximum of 471,185 in August, or with a difference of 144,558. The minimum employment in 1924 was thus almost 9,000 more and the maximum employment about 42,000 less than in 1923, producing a fluctuation in 1924 which was 30 per cent less than the fluctuation in 1923. These figures are claimed to be significant in showing the tendency towards stabilization of employment in the maintenance of way department of the railroads and derive added significance from the fact that fluctuations of traffic and total earnings were greater in 1924 than in 1923. The statistics also show that active maintenance work was begun earlier and carried on more uniformly in 1924 than in the preceding year. That the same policy is being followed in 1925 is suggested by figures which show that between August and December, 1924, a reduction was made of only 87,000 employees, as compared with a reduction of over 115,000 employees in the same period of 1923.

Among the 12 collisions and 11 derailments investigated by the Interstate Commerce Commission for the three months ending with December, 1924, and reported in the last quarterly summary of train accidents issued, only three accidents are indicated as having resulted in part or wholly from conditions involving the maintenance of way department. Chief of these accidents is the wreck of a passenger train on the International-Great Northern which was derailed near Grapeland, Tex., on August 15, while moving at a speed of about 30 or 40 miles an hour, as a result of striking a loose switch. In this wreck, which caused the death of the engineman and the injury of four other persons, the switch rod had become disconnected from the head rod as a result of improper work on the part of the trackmen who had changed the switch stand from the west to the east side of the track six days before the accident. The other two accidents occurred when a New York Central passenger train, moving at about 35 miles an hour, was derailed near Millfield, Ohio, on August 27, when the locomotive struck a board which had been fastened on the rail by a boy nine years old, and the wreck of a freight train on the Virginian which was derailed near Glen Lyn, Va., on September 1, by a landslide in a cut.

The expenditures of Class I railroads for equipment and supplies, not including fuel, amounted to approximately $2,106,000,000 in 1923 which, when increased by $74,000,000, the estimated expenditures by the smaller railroads for similar purchases, produces an estimated grand total of $2,180,000,000 for expenditures by the railroads for purchases from equipment and supply companies. Of the purchases made by the Class I railroads, according to R. H. Aishton, president of the American Railway Association, approximately $232,500,000 was spent for forest products, $460,000,000 for iron and steel products, $57,245,000 for copper, zinc, lead, babbitt, etc., $15,678,000 for lubricating oils and $6,120,000 for cement. Included in these total expenditures, according to President Crowley of the New York Central, is approximately $1,300,000 a year for fusees and torpedos, $2,000,000 for dining car linen, more than $1,000,000 for china and $300,000 for red, blue, green and white bunting for signal flags, etc. A fair estimate of the portion of the Class I railroad earnings distributed among manufacturers of papers, pins, pencils, ink and other items which come under the head of stationery and to printers is given at $19,000,000, while other figures show that in dining cars approximately 8,000,000 lb. of beef are served annually, 2,000,000 lb. of ham, 1,750,000 lb. of lamp chops and 3,500,000 lb. of other meat, while in these same cars are also served 3,250,000 lb. of butter, 6,000,000 qt. of milk, 27,000,000 eggs and 16,000,000 lb. of potatoes. The requirements of the railroads for fuel comprise 20½ per cent of all bituminous coal produced and over 5 per cent of the anthracite and about one-fifth of the fuel oil produced in the country.

Personal Mention

General

A. C. Shields, engineer maintenance of way of the Denver & Rio Grande Western, with headquarters at Denver, Colo., has been promoted to assistant general manager, with the same headquarters, with supervision over maintenance of way and structures, a newly created position. The position of engineer maintenance of way has been abolished.

H. N. Rodenbaugh, general manager of the Florida East Coast, and formerly chief engineer, with offices at St. Augustine, Fla., has been elected vice-president in charge of operation, traffic and construction and a director of the company. Mr. Rodenbaugh was born at Norristown, Pa., on November 20, 1879, and graduated from the University of Pennsylvania in 1901. He entered railway service in January, 1902, as a draftsman in the office of the chief engineer of the Norfolk & Western, leaving that company in July, 1903, to go with the Alan Wood, Iron & Steel Company, Conshohocken, Pa., as yard superintendent. In June, 1904, he returned to railway service as an assistant engineer in the office of the chief engineer maintenance of way and structures of the Southern, with headquarters at Washington, D. C. He left the Southern in October, 1905, to become assistant engineer of bridges and buildings on the Carolina, Clinchfield & Ohio at Bristol, Va. In June, 1906, he was appointed principal assistant engineer of the Virginia & Southwestern, leaving this position in January, 1908, to become structural engineer of the Philadelphia & Reading, with headquarters at Philadelphia, Pa. In June, 1909, he returned to the Southern as an assistant engineer of bridges, serving subsequently as an engineer in charge of terminal construction, supervising engineer and principal assistant engineer in the valuation department, until July, 1918, when he was appointed engineering assistant to the regional director of the Southern region of the Railroad Administration. In March, 1920, he was promoted to regional engineer of the Southern and Pocahontas regions, serving in this capacity until later in the same year when he was appointed chief engineer of the Florida East Coast, with headquarters at St. Augustine. In February, 1923, he was promoted to general manager, which position he was holding at the time of his recent election.

H. N. Rodenbaugh

Engineering

C. D. Johnson has been appointed division engineer of the Alamosa division of the Denver & Rio Grande Western, with headquarters at Alamosa, Colo.

R. L. Adamson has been promoted to division engineer on the Los Angeles Division of the Union Pacific System, with headquarters at Los Angeles, to succeed **H. S. Osborne,** who has been transferred to division engineer on the Colorado division, with headquarters at Denver, Colo.

G. W. Gallier has been appointed district engineer maintenance of way of the Illinois district of the Chicago, Burlington & Quincy, with headquarters at Galesburg, Ill., succeeding **H. C. Murphy,** whose transfer to the Lines West was reported in the February issue.

R. E. Nottingham, formerly instrumentman on the Louisville & Nashville, at Nashville, Tenn., has been promoted to assistant engineer, with the same headquarters, to succeed **R. N. Crapster,** whose promotion to roadmaster was reported in the March issue.

L. L. Sparrow, principal assistant engineer on the Atlantic Coast Line at Wilmington, N. C., has been appointed engineer of statistics, a newly created position. **P. R. Boese** succeeded Mr. Sparrow as principal assistant engineer.

Joseph Brandt has been promoted to cost engineer in the valuation department of the Missouri-Kansas-Texas, where he succeeds **W. L. Churchill,** following the latter's promotion to chief engineer of the Kansas City, Mexico & Orient, as announced in the February issue.

J. D. Mathews, whose promotion to valuation engineer of the Arizona Eastern and the El Paso & Southwestern lines of the Southern Pacific, was noted in the February issue, entered railway service in 1900 as a masonry inspector on the Atchison, Topeka & Santa Fe in southern California and in 1901 was engaged in locating and constructing a railroad line in Mexico, which is now a part of the Southern Pacific of Mexico. In 1902 he was promoted to assistant engineer of the Sonora Railway of Mexico and in 1903, to division engineer on maintenance of way, in which capacity he continued until 1906, when he was placed in charge of construction as an assistant engineer on the Southern Pacific of Mexico. In 1907 he was appointed construction engineer on the Southern Pacific in charge of widening narrow gage lines and subsequently in charge of terminal work in California until 1909, when he was appointed division engineer of the Tucson division of the Southern Pacific. He was promoted to engineer maintenance of way of the Southern Pacific of Mexico in 1918, and in 1920, became valuation engineer of the Arizona Eastern, which position he held until 1925, when he was promoted to engineer of valuation of the Southern Pacific, with headquarters at El Paso, Texas.

J. D. Mathews

Track

R. T. Huson, transitman in the engineering department of the Kansas City Southern, has been promoted to roadmaster, with headquarters at Shreveport, La., to succeed **J. L. McColpin.**

W. M. Gates has been promoted to roadmaster on the Gila district of the Southern Pacific, Pacific system, with headquarters at Gila, Ariz., succeeding **J. J. Galligan,** who has been assigned to other duties.

J. B. Conley, supervisor of the Waynesburg & Washington, a subsidiary of the Pennsylvania, with headquarters at Waynesburg, Pa., has been appointed supervisor of the Ohio River & Western, also a subsidiary of the Pennsylvania, with headquarters at Woodsfield, Ohio, to succeed **A. R. Doan,** retired on a pension.

T. Mika, division roadmaster on the Great Northern, with headquarters at Sioux City, Iowa, has been transferred to the Breckenridge division, with headquarters at Breckenridge, Minn., to succeed **F. A. Nolan,** who has been granted leave of absence and the jurisdiction of **C. Hara,** division roadmaster on the Wilmar division, with headquarters at Wilmar, S. D., has been extended to include the Sioux City division.

G. A. Owens, whose promotion to roadmaster of the Newport and Oxford subdivisions of the Canadian Pacific, with headquarters at Farnham, Que., was reported in the February issue, was born at Osgoode Station, Que., on March 9, 1876,

and entered railway service as a section man on the Canadian Pacific on June 15, 1893. He was promoted to section foreman in August, 1905, to extra gang foreman in 1906, snow plow foreman in 1908, and to roadmaster on March, 1917, since which he has continued in the employed of the Canadian Pacific at various points until his recent appointment to roadmaster in charge of the Newport and Oxford subdivisions.

O. Odegard, section foreman on the Minneapolis, St. Paul & Sault Ste Marie, has been promoted to roadmaster, with headquarters at Crosby, Minn., to succeed **M. I. Krogstad,** who has been transferred to Appleton, Wis., in place of **Charles M. Hayes,** upon the latter's promotion to acting general roadmaster, as reported in the March issue.

Walter G. Kerst, whose promotion to roadmaster on the Chicago, Burlington & Quincy, with headquarters at Wymore, Neb., was reported in the March issue, was born on July 4, 1890, and entered railway service in 1905 as a section laborer on the Chicago, Burlington & Quincy. He was promated to foreman in 1911, with headquarters at Bruning, Wyo., and served at this and other points until 1922, when he was placed in charge of a steel gang. He served as a foreman of steel and surfacing gangs at different points until May, 1924, when he was placed in charge of the Denver, Colo., yards as general track foreman, the position he was holding at the time of his recent promotion to roadmaster.

Robert N. Crapster, whose promotion to roadmaster on the Louisville & Nashville, with headquarters at Paris, N. C., was reported in the March issue, was born on February 15, 1890, at Simpsonville, Ky., and entered railway service in 1910 as a rodman on the Louisville & Nashville. During 1911 and 1912 he was employed as transitman and topographer and in 1913 was promoted to assistant resident engineer. He served in this capacity and as resident engineer until 1916, when he was placed in charge of a valuation party. He entered military service in 1907 with the 17th Railway Engineers and was overseas with this regiment until the close of the war, when he returned to the Louisville & Nashville and served in charge of a location party until 1921, when he was appointed assistant engineer, the position he was holding at the time of his recent promotion.

Arthur B. Hillman, assistant engineer of the Belt Railway of Chicago, has been promoted to roadmaster, with headquarters at Clearing, Ill., to succeed **E. Bostrum,** resigned. Mr. Hillman was born on December 24, 1889, at Chicago, and studied engineering at the University of Illinois, from which he graduated in 1914. He entered railway service in June, 1914, as a rodman on the Chicago & Western Indiana and served consecutively as rodman, levelman and transitman on track elevation work until October, 1916, when he was promoted to assistant engineer on maintenance, the position he occupied continuously up to the time of his present promotion to roadmaster, except for two years from 1917 to 1919 when he served in the U. S. Army as captain of infantry, including six month's overseas duty.

Charles M. Hayes, whose promotion to acting assistant general roadmaster on the Minneapolis, St. Paul & Sault Ste Marie, with headquarters at Minneapolis, Minn., was reported in the March issue, was born on February 4, 1893, at Sawyer, Wis., and entered railway service for the first time during the summer of 1910 as a section laborer on the Minneapolis, St. Paul & Sault Ste Marie. He re-entered railroad service as a section laborer in November, 1911, and was promoted to section foreman at Goodwin, Wis., on November 16, 1913. From April 1, 1916, to December 3, 1916, he was engaged as an assistant extra gang foreman and in the spring of 1917, was promoted to extra gang foreman. He was promoted to roadmaster, with headquarters at Moose Lake, Minn., on May 1, 1919, and served in this capacity first at Moose Lake, then at Rhinelander, Wis., and finally at Appleton, Wis., until his recent promotion to acting roadmaster.

William O. Dennis, whose promotion to inspector of maintenance of way on the Lehigh & New England, with headquarters at Bethlehem, Pa., was reported in the March issue, was born on December 31, 1882, at Nazareth, Pa., and graduated from the Lafayette college in 1905. He entered railway service in 1905 as a transitman in the office of the chief engineer on the Lehigh & New England at Pen Argyl, Pa., and after service as transitman and draftsman on maintenance and construction work until September, 1909, was promoted to assistant engineer, with headquarters at Bethlehem, Pa. On March 16, 1913, he was promoted to assistant supervisor of track, with headquarters at Pen Argyl, Pa., and on April 1, 1917, was promoted to supervisor, with the same headquarters, which position he was holding at the time of his recent promotion to inspector of maintenance of way.

E. Schoech has been promoted to roadmaster on the Chicago, Milwaukee & St. Paul, with headquarters at Ottumwa Junction, Iowa, to succeed **J. H. Henberger,** who has been transferred to the Chicago terminals, with headquarters at Cragin, Ill., to replace **A. J. Barbee. L. Hansen** has been promoted to roadmaster at Farmington, Minn., succeeding **A. H. Hoberg,** who has been transferred to Milbank, S. D., to relieve **C. A. Drawheim,** following the latter's transfer to Mayfair, Ill., to take up the work of **B. C. Dougherty,** who has been appointed inspector of roadway and material on the Reclamation committee, the position formerly held by **P. H. Madden,** whose death was reported in the November issue. **J. Gould** has been promoted to roadmaster at Beloit, Wis., to succeed **W. H. Armstrong,** who has been transferred to Horicon, Wis., following the appointment of **A. F. Carlson** to Watertown, Wis., where he succeeds **E. A. Buffmire.** Mr. Schoech was born on August 30, 1900, and entered railway service in 1913 as a section laborer on the Chicago, Milwaukee & St. Paul at Blakesburg, Iowa. He served as acting foreman in 1914 and 1915 while the regular section foremen were engaged in extra gang work and was promoted to section foreman in 1917, in which capacity he was employed continuously until February 15, when he was promoted to roadmaster on the East Kansas City division.

Bridge and Building

Galen Wood, chemist at the Port Reading creosoting plant of the Central Railroad of New Jersey and the Reading, has resigned after seven years' service in that position to engage in private practice as a consulting chemical engineer, with office at Philadelphia.

George Wilson, who has been promoted to supervisor of bridges and buildings on the Union Pacific, with headquarters at Green River, Wyo., was born on August 6, 1884, at Winfield, Kan., and entered railway service in 1906 as a steel worker on the Atchison, Topeka & Santa Fe. He continued on this work until November, 1909, when he entered the employ of the Union Pacific as a steel worker, where he was employed until May, 1916, when he was promoted to assistant foreman. He was promoted to foreman on July 1, 1907, and was serving in this capacity up at the time of his promotion to supervisor of bridges and buildings.

Obituary

C. E. Dodge, consulting engineer of the Southern Pacific, when that railroad curbed the Colorado river flood in 1906 which threatened to engulf the Imperial valley of California, died recently in Los Angeles, Cal., of heart trouble.

Jeremiah O'Connor, general roadmaster of the Minneapolis, St. Paul & Sault Ste Marie, whose death was reported in the March issue, was born on August 17, 1862, and received his first appointment as section foreman on the Minneapolis, St. Paul & Sault Ste Marie on July 1, 1887. He was promoted to roadmaster shortly thereafter and served in this capacity in Wisconsin, North Dakota and Minnesota, until April, 1909, following which he was special roadmaster in charge of the heavy construction work being carried out in the vicinity of Duluth and Superior, also on the Montana extension and other locations. With the completion of this work in 1919, he was promoted to general roadmaster of the system, and continued in this capacity and in the same capacity on the Duluth, South Shore & Atlantic up to the time of his death. His entire career was with the Soo Line except a short period in 1900 when he served on the Northern Pacific.

In the new terminal station to be built in Chicago by the Illinois Central, provision is made for 80 station tracks which are to be arranged on three levels.

Construction News

The Alton & Eastern proposes to spend $500,000 for improvements to that portion of the defunct Chicago, Peoria & St. Louis, 38 miles, which it has been authorized to purchase by the Interstate Commerce Commission.

The Atchison, Topeka & Santa Fe plans an addition to the stores department building at San Bernardino, Cal., of reinforced concrete, three stories high, and 20 ft. long by 50 ft. wide.

The Boston & Albany has awarded a contract to the Palmer Steel Company, Springfield, Mass., for the structural steel work on this company's new station at Springfield.

This company has recently awarded a contract to the New England Construction Company, Springfield, Mass., covering the tearing down of the present station buildings, retaining wall, etc., at Springfield, Mass., preparatory to the erection of the new union station.

The Canadian National has a bill in the House of Commons providing for the building of a branch line from Turtleford, Sask. The line will have a mileage of 67, including 23 miles already graded. The total estimated cost will be $1,871,000. This bill was one of those passed last session by the House of Commons, but rejected by the Senate.

The Canadian Pacific's program of construction and betterments for the year includes coaling stations at Eagle River, Man., Rocanville, Hazenmore, Sask., Abbey, Alta., Wetaskiwin, and at North Bend, B. C.; and steel water tanks at English River, Man., Molson, Elkhorn, Broadview and Souris.

This company is planning to extend the Cutknife-Whitford branch line to Edmonton, Alta., by way of Clover Bar. This line is now in operation from Cutknife, Sask., to Battle River, and the company intends to grade and lay rail for 80 miles from Battle River to a point 25 miles beyond Lloydminster, Alta., this year. The survey passes midway between the Canadian National line and the Saskatchewan river to a point north of Whitford Lake and then southwest to Edmonton.

The Chesapeake & Ohio has authorized an expenditure of $565,000 for second track work, also a new engine terminal at Russell, Ky., to cost $1,104,450.

The Chicago, Milwaukee & St. Paul will receive as a loan from the city of Chicago $1,500,000 for the elevation of its tracks at Mayfair in Chicago. The funds are to be secured through a bond issue, which was approved by the voters of Chicago at a recent election.

The Chicago, Rock Island & Pacific contemplates an expenditure of approximately $3,000,000 during the year for construction to include a second main track from McFarland, Kan., to Latimer, a distance of 42 miles, to cost $1,200,000; a branch line from Billings, Okla., to Ponca City, approximately 40 miles, to cost $854,000; a grain elevator at Council Bluffs, Ia., to cost $200,000; a freight terminal at Omaha, Neb., to cost $250,000; track elevation at Chicago to cost $300,000; and a coal chute at Topeka, Kan., to cost $30,000.

The Denver & Rio Grande Western is planning to spend $1,000,000 during the year for improvements in its Burnham shops at Denver, Colo.

The Erie is expected to call for bids about the 1st of May for the reconstruction of its piers at Jersey City, N. J., which were destroyed by fire several months ago.

The Fort Worth and Denver South Plains has been incorporated in the state of Texas by officers of the Chicago, Burlington & Quincy for the purpose of constructing approximately 200 miles of line through eight counties centering about Estelline, Tex., to be used as feeders for the Fort Worth & Denver City which is also controlled by the Burlington.

The Fort Worth & Denver South Plains was chartered on March 6 in Texas to construct a line from Estelline, Tex., to Dimmitt, a distance of 200 miles.

The Gulf Coast Lines is reported to have plans for the construction of an additional freight station, a 64-ft. extension to the present freight station, and an 80-ft. extension of the loading platform at Harlington, Texas.

This company will undertake in the near future the construction of a 9-mile extension from a point between Lyford, Texas, and Raymondville, to Edinburg, the project to cost approximately $450,000.

The Gulf, Colorado & Santa Fe is preparing plans for a two-story and basement freight house, 40 ft. by 100 ft., at Fort Worth, Tex., and for the construction of a $300,000 one-story machine shop 120 ft. by 340 ft. and a wing 70 ft. by 100 ft., at Cleburne, Tex.

The Illinois Central is contemplating the erection of a union passenger station at Jackson, Miss., to cost approximately $750,000.

The Kansas City Southern's plans for new facilities to be constructed this year include industry tracks at Port Arthur, Tex., and Shreveport, La., to cost $30,000; a creosoted ballasted deck trestle at new grade near Kingston, La., to cost $26,000; and a brick freight and passenger station at Gentry, Ark., to cost $22,500.

The Long Island expects to rebuild immediately a two-story brick electric car shop at Morris Park, L. I., which was destroyed with practically all equipment at a loss of $500,000 as a result of a fire on March 2.

The Missouri Pacific has awarded a contract to the L. M. Wimberly Construction Company, Arcadia, La., for the construction of a 10 mile extension of the Eudora branch from Epps, La., to Delhi, reported in the December, 1924 issue. The project will cost approximately $350,000.

The Los Angeles Harbor Committee, which includes representatives of the Southern Pacific, the Union Pacific, the Atchison, Topeka & Santa Fe and the Pacific Electric, has reported that unification of Los Angeles Harbor railway terminal facilities can be carried out at a cost of $250,000. The plan involves the completion of the Municipal Belt Line which will connect all the harbor lines now in use.

The National Railways of Mexico will soon begin the construction of a line to connect Yavaros, a port on the West coast, with Chihuahua. The new line will provide rail communication between the state of Sonora and the central part of Mexico without going through the United States as at present.

The New York Central plans to enlarge its coal dock at Toledo, Ohio, with the installation of a coal unloading machine which will handle 100-ton cars.

The Norfolk & Western has awarded contracts to H. M. Waugh, Bluefield, W. Va., for second main track at Wilcoe, W. Va., and Tug, W. Va., to cost approximately $270,000, also for nine tracks to cost about $90,000. A contract has also been awarded to Elmwood Comer, Cincinnati, Ohio, for additional track facilities to Berrys, Ohio, Ivorydale and Idlewild to cost approximately $164,000.

The Pacific Electric has awarded a contract to the P. J. Walker Company, Los Angeles, for the construction of a subway terminal building in Los Angeles, to cost approximately $4,000,000.

The Pennsylvania has awarded a contract to the Dravo Construction Company, Pittsburgh, Pa., for the construction of a new bridge across the Beaver river at Beaver Falls, Pa., to cost approximately $200,000, also a contract to J. McMenamin, Philadelphia, for the reconstruction of its viaduct over Streets at Hays Section, Pa., to cost approximately $300,000, improvements to the passenger terminal at Pittsburgh to cost approximately $12,000,000 are contemplated and will be undertaken as soon as approval from the Public Service Commission is secured and certain streets are vacated by the city, which has already passed an enabling ordinance.

This company received bids, on March 18, for the early construction of a low grade line from Canton, Ohio, to Bayard to cost about $4,500,000.

The Pittsburgh & Lake Erie has awarded a contract for the reconstruction of a 20-stall enginehouse at McKees Rocks, to the Walker & Curley Company of Pittsburgh, Pa.

The Richmond, Fredericksburg & Potomac plans the construction of new sidings, to cost approximately $71,000 at Doswell, Va., Arkendale and Featherstone. Existing sidings

at Massaponax, K. N. Tower and W. H. Tower will be extended at an approximate cost of $63,500.

The Salt Lake & Denver has applied to the Interstate Commerce Commission for authority to construct a line from Provo, Utah, through the Uintah basin to a connection with the Denver & Salt Lake at its western end, Craig, Colo., 297 miles. The application states that this would provide a route 170 miles shorter than that of the Denver & Rio Grande Western between Provo and Denver.

The San Benito & Rio Grande Valley has awarded a contract to W. H. Nichols & Co., Dallas, Tex., to grade and build bridges on 15 miles of line from Santa Maria, Tex., east.

The Southern Pacific has applied to the Interstate Commerce Commission for authority for the construction of an extension from Hinsdale, Cal., north 10 miles into Reclamation Districts 660 and 70 and is preparing plans for a warehouse with an 850 ft. frontage on the ship channel at Clinton, Tex., as a part of the improvement which the company will make at its deep-water terminal at this point. The warehouse will contain approximately 160,000 sq. ft. of floor space.

The Temiskaming & Northern Ontario's line into the new gold region of Rouyn, Que., will be started immediately, according to an announcement made by Premier G. Howard Ferguson in the Ontario Legislature at Toronto last week. The Rouyn line will be an extension of the Swastika branch and 37 miles long and will cost approximately $1,750,000.

The Terminal Railroad Association of St. Louis has applied for authority to extend the Seventh avenue viaduct, St. Louis, Mo., over its tracks a distance of 360 ft., and to construct under the viaduct an extension of the Atlantic street yard, the additional trackage to aggregate 21,000 ft. in length. The extension of the viaduct will be of reinforced concrete construction.

The Texas, Panhandle & Gulf proposes to construct a line from Tucumcari, New Mex., to Seymour, Tex., a distance of 304 miles, and a branch line from Ft. Worth, Tex., to Perrin, a distance of 55 miles. The citizens of Ft. Worth, Tex., are reported to be planning to organize a trust company to take over the rights and holdings of C. H. Powell of Chicago, who has been promoting the constructin of this road. An effort is now being made to sell $4,000,000 of preferred stock in the company.

The Wabash is taking bids for the construction of three reinforced concrete coaling stations, one of 400 tons' capacity at St. Louis, Mo., another of 300 tons' capacity at Bement, Ill., and another of 200 tons capacity at Tracy, Iowa.

The Waco, Beaumont, Trinity & Sabine has received a certificate from the Interstate Commerce Commission authorizing the company to extend its line from Livingston, Tex., to Beaumont and to construct a belt line at Beaumont. The entire cost of the project including equipment is estimated at $2,606,253.

Track Materials

The Atchison, Topeka & Santa Fe has ordered 2,500 tons of tie plates from the Illinois Steel Company.

The Chicago & North Western has ordered 2,000 tons of angle bars from the Illinois Steel Company.

The Chicago & Western Indiana has placed an order for 4,000 tons of rails with the Illinois Steel Company.

The Florida East Coast has ordered 16,300 tons of 90-lb. rail from the Tennessee Coal, Iron & Railroad Company.

The New York, Chicago & St. Louis has ordered 2,500 tons of tie plates from the Railroad Supply Company.

The St. Louis Southwestern has ordered 4,000 tons of rails and a quantity of angle bars from the Illinois Steel Company.

The St. Louis, Troy & Eastern has ordered 2,800 tons of rails from the Illinois Steel Company.

The Wabash has divided an order for 10,000 tons of rails among the Illinois Steel Company, the Inland Steel Company and the Bethlehem Steel Corporation.

Supply Trade News

General

The Lehon Company, Chicago, has moved its New York office from 95 Liberty street to 60 Broadway.

The Northern Conveyor & Manufacturing Company, Milwaukee, Wis., will construct a one-story, 60 ft. by 120 ft., factory building at Janesville, Wis.

The Duff Manufacturing Company, Pittsburgh, Pa., has moved its New York office from 50 Church street to 250 Park avenue.

The Kansas City Bolt & Nut Company will construct a one-story plant 90 ft. by 240 ft. in Kansas City, Mo., at an estimated cost of $23,000.

The National Association of Purchasing Agents will hold its tenth international convention and exposition in Milwaukee, Wis., on May 25 to 28.

The Crane Company, Chicago, has purchased the former station of the Atchison, Topeka & Santa Fe at Phoenix, Ariz., and will erect an office building and warehouse to cost $500,000.

The Harnischfeger Corporation, Milwaukee, Wis., has prepared plans for a one-story brick and steel addition, 60 ft. by 88 ft., to the core room of its electric steel foundry in Bay View, Wis.

Laughlin & Cheney, Chicago, have been appointed sales representatives for the **Hackman Railway Supply Company,** Chicago, to handle the sale of the Hackmann and Idol track liners and other track appliances manufactured by the Hackman company, in the Central West. This company has also been appointed general railway sales agents for the **Rawls Machinery & Manufacturing Company,** Chicago, for the entire United States.

Personal

C. O. Dowdell has been appointed special western railroad representative of the **Barber Asphalt Company,** with headquarters at 1344 Union Trust building, Chicago.

A. A. Boschert has been appointed sales engineer of the **Harnischfeger Corporation,** with headquarters at Seattle, Wash., to cover Washington and Oregon.

J. J. Flaherty, formerly in charge of welding for the Boston Elevated Railways, has been appointed director of sales of the **Page Steel & Wire Company,** with headquarters at Bridgeport, Conn.

M. B. MacNeille, chief engineer of the hydraulic department of **Fairbanks, Morse & Company,** with headquarters in Three Rivers, Mich., has been promoted to manager of the pump division.

George C. Hannaway, formerly of the National Refining Company, has been appointed sales manager of the **T. J. Moss Tie Company,** St. Louis, Mo., with headquarters at 1142 Strauss building, Chicago.

H. G. Von Nostrand of the sales department of the Illinois Steel Company, Chicago, and formerly manager of tie plate sales of the Railroad Supply Company, Chicago, died on March 19, following an illness of six weeks.

H. A. Marshall, formerly water chemist of the Chesapeake & Ohio, has become associated with the **Aluminate Sales Corporation, Chicago,** in the promotion of aluminute of soda for use in water treating.

Arthur E. Bendelari, who has been in charge of operations in Missouri and Oklahoma for the **Eagle-Picher Lead Company,** has been appointed vice-president to succeed **Thomas R. Brown, Jr.,** retired.

Harleigh H. Hartman has opened an office, as consultant and adviser in railroad problems arising out of administration of the Interstate Commerce Act, at 610 Mills building, Washington, D. C. Mr. Hartman was formerly valuation attorney, rate and finance examiner with the Interstate Commerce Commission.

Charles R. Long, Jr., president of the **Charles R. Long, Jr., Company**, manufacturers of railway and industrial paints, Louisville, Ky., and vice-president of **Harry Vissering & Company**, manufacturers of railway supplies and equipment, has purchased the entire interest of **Harry Vissering** who has retired from these companies.

R. P. Townsend has been appointed eastern assistant manager of the railroad department of **Johns-Manville, Inc.**, with headquarters at New York. Mr. Townsend entered the service of the New York Central in November, 1906, after having graduated from Walworth Institute. He resigned in July, 1917, to become purchasing agent and later assistant to vice-president of the Liberty Steel Products Company, which later changed its name to the American Railway Appliances Company. He resigned from that company in March, 1924, to enter the railroad department of the Murphy Varnish Company, which position he held until his new connection with Johns-Manville, Inc.

George M. Hogan, secretary and general sales agent of the **Sellers Manufacturing Company**, with headquarters in Chicago, has been promoted to vice-president, with the same headquarters. He was born in Chicago on October 9, 1883, and received his education in St. Ignatius College, Chicago. He entered the employ of the Sellers Manufacturing Company on August 20, 1906, as a shipping clerk in the plant in Maywood, Ill. He held several positions in the operating and accounting departments in the plant until October 1, 1912, when he entered the sales department as sales agent, with headquarters in Chicago. He held the latter position until April, 1917, when he was promoted to general sales agent, which position he held until January 1, 1918, when he was appointed assistant secretary and general sales agent, with the same headquarters. In February, 1919, he was promoted to secretary and general sales agent, with the same headquarters, which position he has held until his recent promotion.

George M. Hogan

Trade Publications

Shovels.—A circular has been issued by the Zenith Shovel Company, Chicago, descriptive of the Zenith track shovel in connection with which the several improvements, which this shovel is claimed to present in shovel design, are set forth.

Water Filters.—An 8-page bulletin No. 501 has been issued by the Graver Corporation, East Chicago, Ind., devoted to filter equipment for purifying water. This bulletin develops the theory and advantages of filtration and describes in detail, with the aid of photographs, the Graver systems. It also contains a catalogue of filter accessories, including an automatic feeding system for coagulants.

Coaling Plants.—Roberts & Schaefer Co., Chicago, has issued an 11-page circular illustrating its R & S shallow-pit coaling station, both with respect to the details of its construction and operation and to its application in railway service. The illustrations are principally photographs which are supplemented with descriptive matter covering this equipment and to a limited extent the other types of coal handling equipment designed by this company. Recent issues of the company also include a bulletin devoted to a description of a new electrically operated hoist for coaling stations.

Paving Brick.—"Making Brick Pavements" and "Brick Roads," are the titles of two pamphlets recently issued by the National Paving Brick Manufacturers' Association, Cleveland, Ohio. The first of these is a general outline of the methods of manufacture and practices in the construction of pavements with numerous illustrations of manufacturing and construction methods. The second, while dealing primarily with the subject of public highways, contains considerable information of interest and value to the officer who is confronted with the problem of paving around stations, freight-houses, team yards, etc. It includes records and service life, comparative cost analyses, etc.

24-Hour Concrete: The Atlas Lumnite Cement Company, New York City, has issued a 32-page, illustrated booklet descriptive of the alumina cement which this company manufactures. The booklet gives the chemical composition of lumnite cement. It also treats of a wide variety of possible uses such as road crossings, bridge approaches, abutments and piers, repairs, floors, platforms, etc., at points where it is necessary to do the work with the least disturbance to traffic, railway, vehicular or pedestrian. The text includes the results of a number of laboratory and field tests, giving the strength at periods varying from one day to three months. The illustrations show a wide variety of installations where this type of cement was used, as well as views of field tests for full loading 24 hours after pouring.

How to Cure Concrete.—The Dow Chemical Company, Midland, Mich., has issued a 50-page booklet bound in fabrikoid, which comprises an exposition of the curing of concrete, particularly pavements, with a special preparation of calcium chloride, known as Dowflake. It outlines the difficulties encountered in curing concrete due to rapid evaporation of the mixing water where large surface areas are exposed to the sun and air. It also describes the methods which have been devoloped for protecting the concrete from this deteriorating effect, particular reference being made to the use of calcium chloride. Specifications for the purchase of calcium chloride and a number of valuable quantity tables are appended to the text. The book is well illustrated.

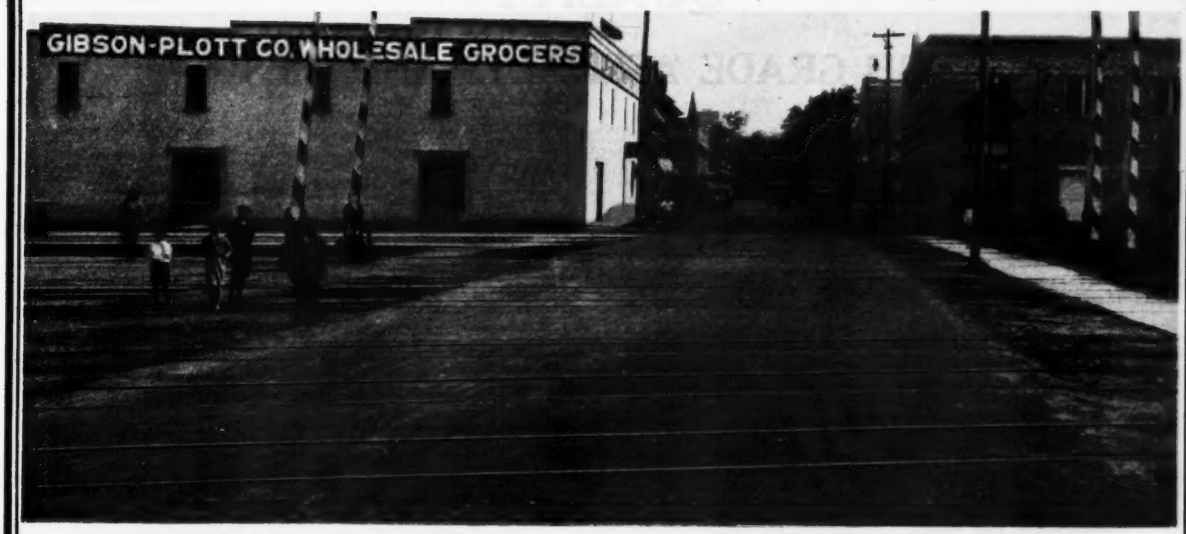
The Sixty-eighth Congress adjourned on March 4, with practically no new railroad legislation having been placed on the statute books.

The Chicago, Rock Island & Pacific has acquired control of the St. Louis Southwestern. It is expected, however, that the properties will be operated independently, as at present.

Pensions amounting to $4,194,023 were paid to retired employees on the Pennsylvania in 1924, the number of such employees being 1,259. This expenditure raises the total payments which have been made by the Pennsylvania's pension system during the last quarter century to $36,381,892. Altogether, 17,605 employees have been retired during this period, of which 7,934 are still living, the oldest being a former watchman on the Elmira division who is now 99 years old.

What is said to be the fastest train run between Washington, D. C., and New York City, was made on the afternoon of March 4, when a special train carrying films of the inauguration of President Coolidge covered the distance of 224 miles between the two cities at the rate of 61 miles an hour, including seven minutes required for changing engines at Manhattan Transfer. Other motion picture concerns employed airplanes to send their films to Philadelphia, Chicago and San Francisco, but the films shipped by railroad to New York were made ready for use in less time by reason of the opportunity afforded for developing and drying the films enroute.

Three new high speed passenger trains are to be operated between St. Louis and the East, according to announcements of the Baltimore & Ohio, Pennsylvania and New York Central. The Baltimore & Ohio train, called "The National Limited," is similar to "The Capitol Limited" now running between Baltimore and Chicago, and proposes to provide the quickest schedule between St. Louis and Washington. The Pennsylvania train will be called "The American" and will operate on a 24-hour limited service between St. Louis and New York City, while the New York Central train, called "The Southwestern Limited," will run between New York and St. Louis in 24 hours and 50 minutes, arriving 45 minutes earlier than at present.



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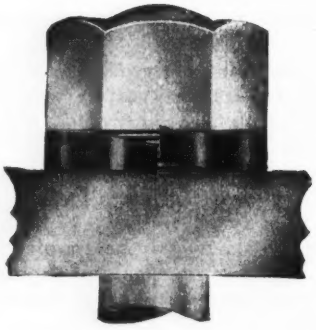

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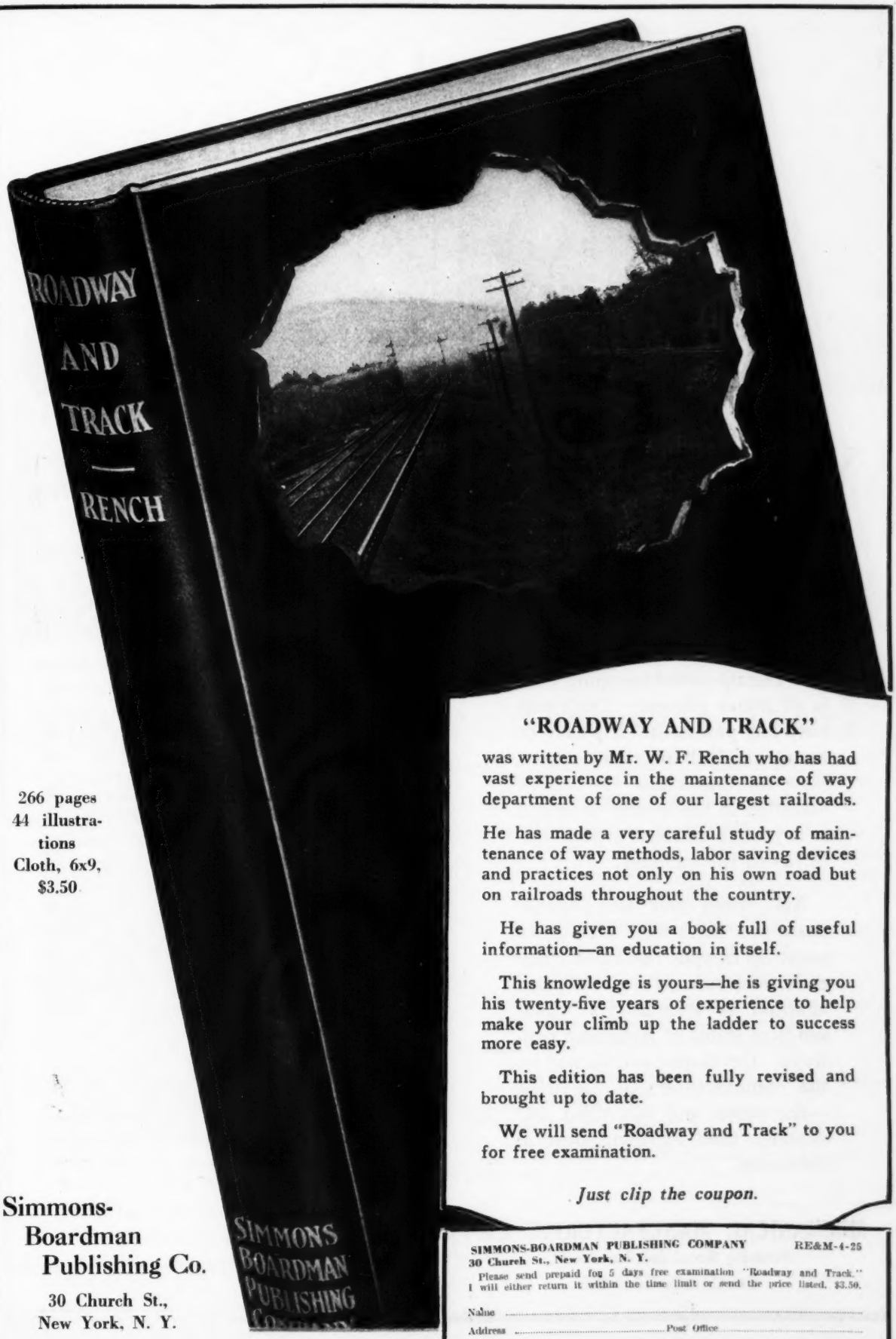

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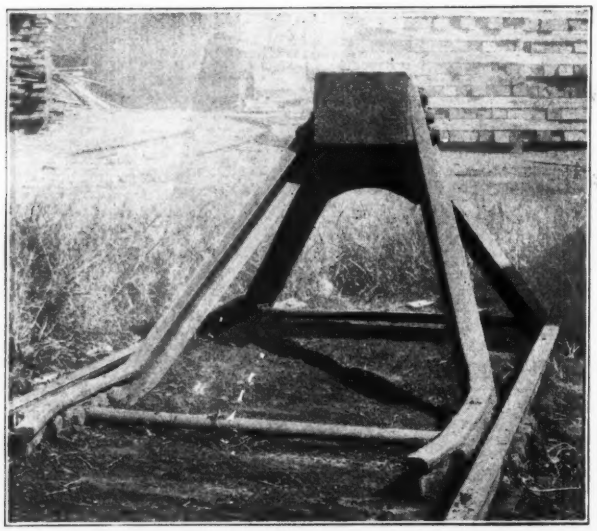

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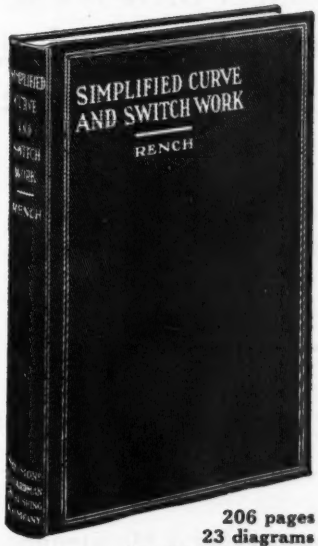
by W. F. Rench, author of "Roadway and Track"



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23 diagrams
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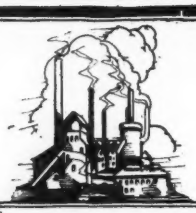

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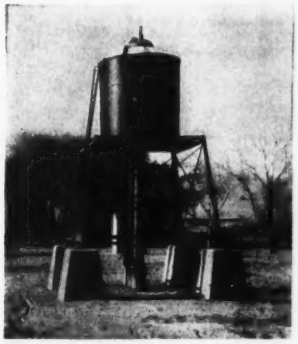

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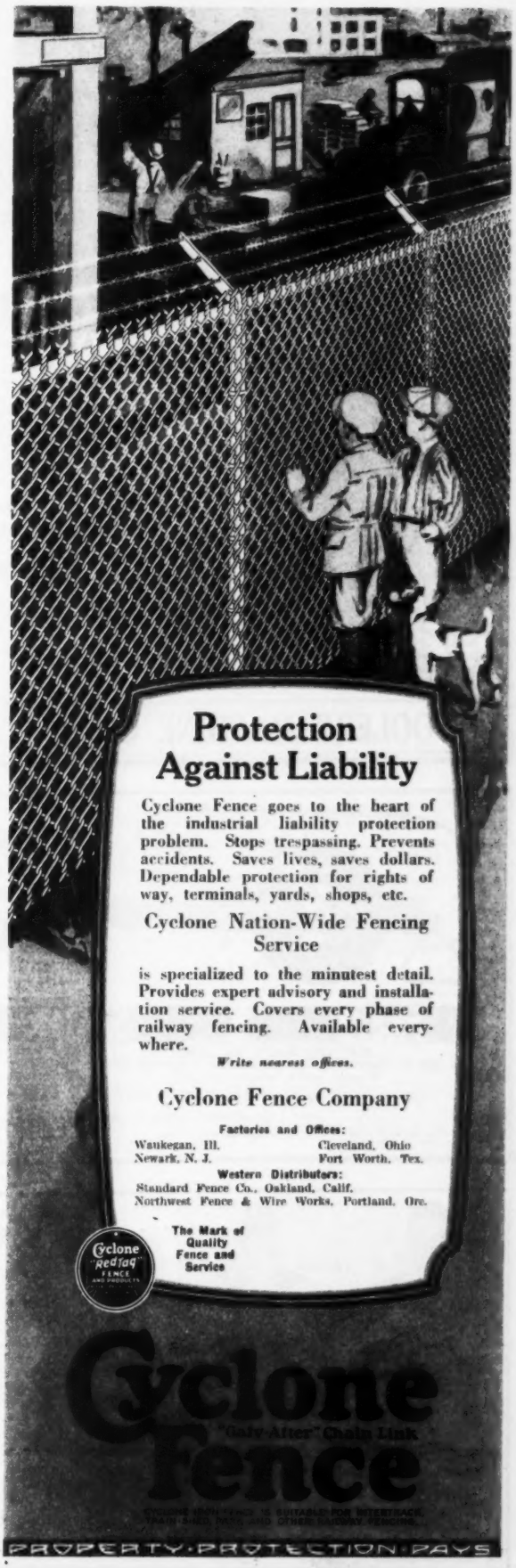
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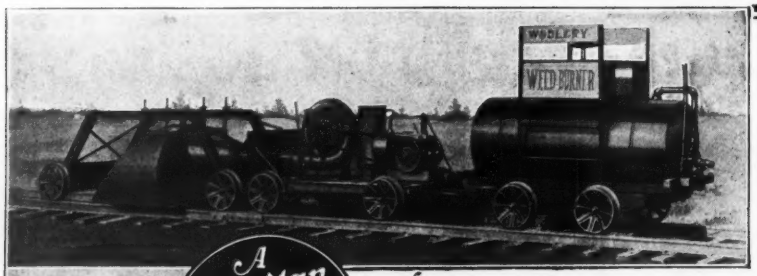

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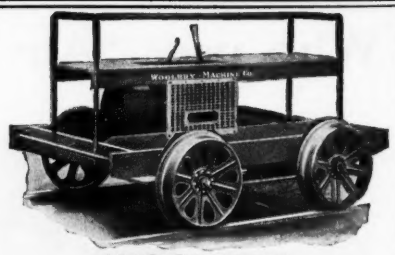

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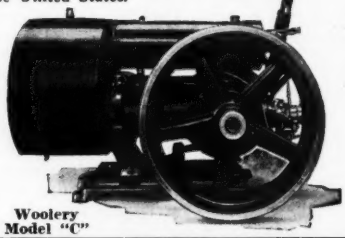

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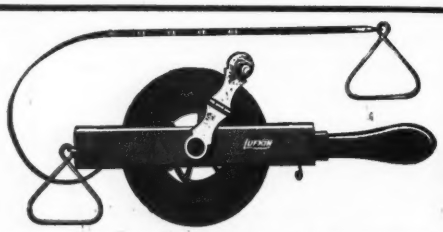

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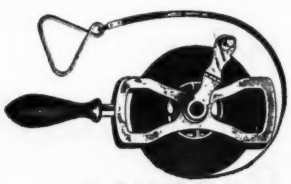

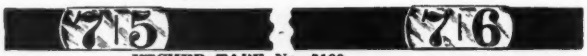

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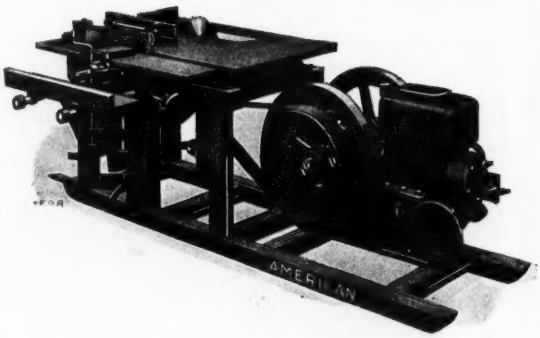

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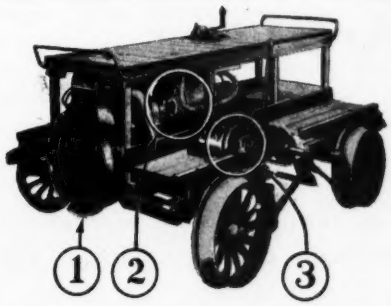

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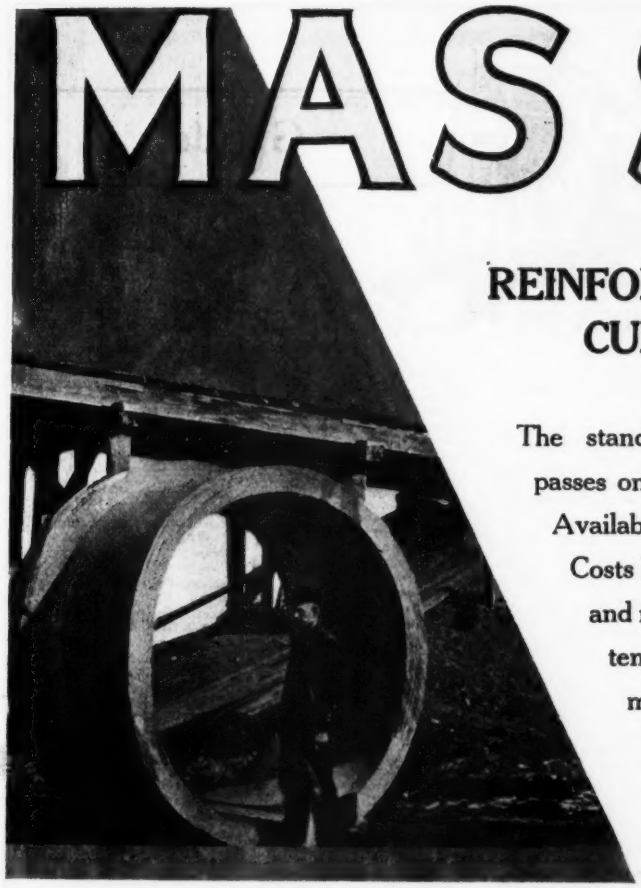

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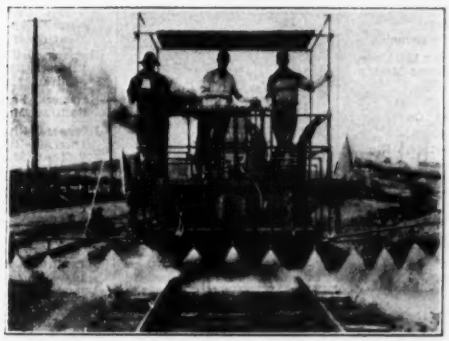

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Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

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Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Mudge & Co.
Northwestern Motor Co.
Woolery Machine Co.

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Northwestern Motor Co.
Woolery Machine Co.

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Buda Co.

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Fence.
Anchor Post Iron Works
Cyclone Fence Co.

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Sullivan Machinery Co.
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Hammers, Steam.
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Rail Joint Co.

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American Valve & Meter Co.

Pile Drivers.
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McMyler-Interstate Co.

Piling.
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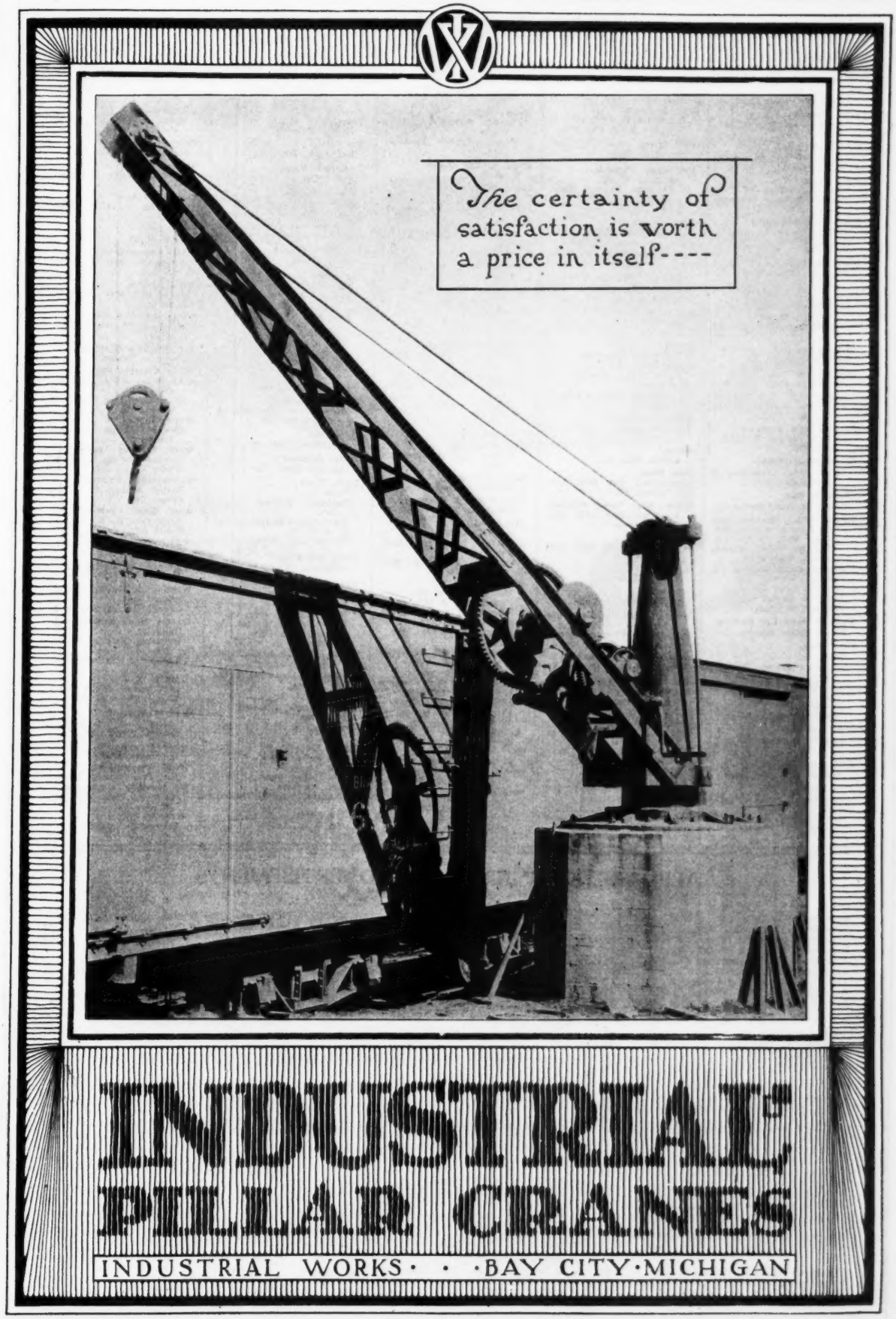
Massey Concrete Products Corp.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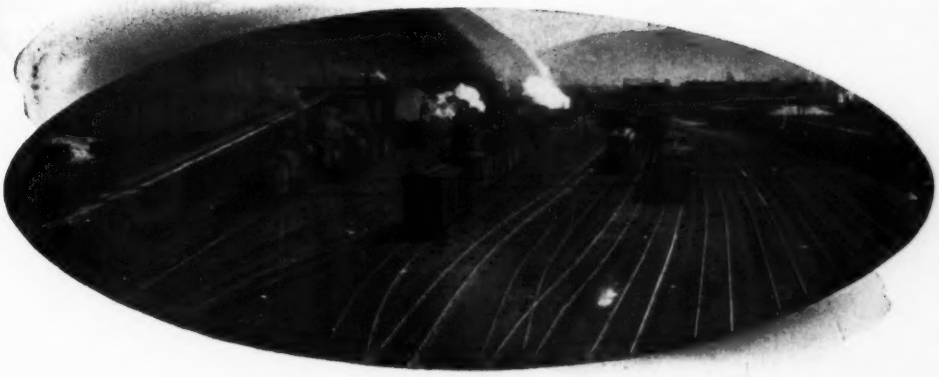

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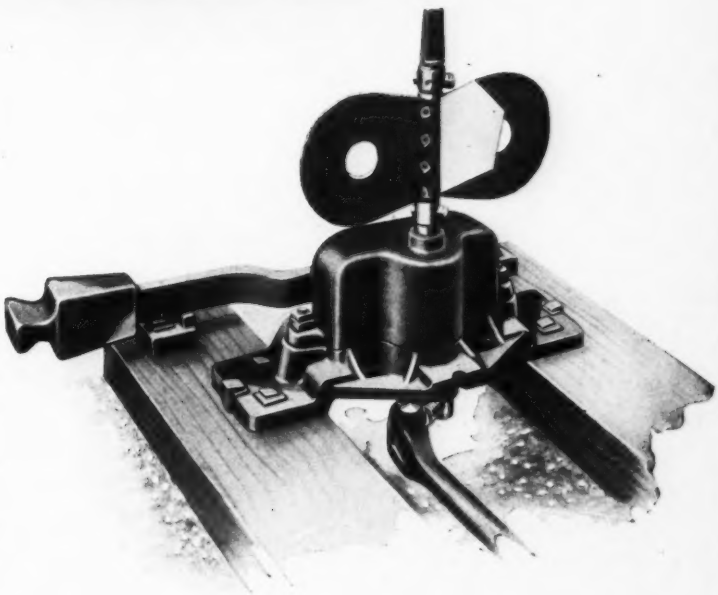
ANDERSON

(gearless)

Switch Stand



SIMPLICITY — Strength — Safety are so combined in the new Anderson Duro as to make the superiority of this switch stand at once apparent.

In the operating mechanism, cams and gears have been eliminated. Steel introduced for all wearable parts. Base Construction of malleable iron.

The element of absolute safety is an outstanding Duro feature. Lever crank position by design is past dead center so that no amount of pressure or vibration can cause a Duro to open the slightest degree—This is the reason Duro needs no latches on Yard Switches. Latches are furnished where padlocking is required.

It is unquestionably the one-switch stand.

Scientifically Built for Long Service

Manufactured by

The American Valve and Meter Co.

CINCINNATI, OHIO

There's a track man in every Spring

In every Verona Rail Joint Spring can be found an alert, powerful track man. His job is to keep two bolts tight.

No matter what may happen to those bolts, the track man is there to correct it. If they stretch or rust or wear, he instantly takes up the resulting slack. He works thru a greater distance than any other nut-locking device, has an enormous reserve power, and exerts constantly the greatest reactive pressure ever applied to a track bolt in actual practice.

But that is not all. The Springs cushion the shock of the rolling load and distribute it equally between pairs of bolts. By keeping the joints constantly tight, they lengthen the life of rails, angle-bars, bolts, nuts, and rail-end ties. They do away with the necessity for periodic bolt tightening.

The alert powerful track men in Verona Rail Joint Springs are looking for a job on your road. Put them to work.

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